Relocation, Renovation, and Redesign of Kellogg House

A Case Study of the Center for Environmental Studies at Williams College

by
Laura Cavin

* * * *

This thesis is dedicated to the future of Kellogg House and the
Center for Environmental Studies at Williams College.

By exploring and integrating what seems important in any building,
I hope to have opened some doors to a way of looking at this building,
the spaces within, and the uses of them.

A thesis submitted in partial fulfillment
of the requirements for the
Degree of Bachelor of Arts with Honors
in Contract Major:
Environmental Design

WILLIAMS COLLEGE

Williamstown, Massachusetts

January, 2005

Table of Contents:

Appendix

1. INTRODUCTION

When you build a thing you cannot merely build that thing in isolation, but must also repair the world about it, and within it . . . and the thing which you make takes its place in the web of nature. -Christopher Alexander, Architect, 1977[1]

Williams College is continually interspersed with many large scale building projects that influence the campus center, pedestrian flows, and other buildings throughout campus. The largest of these projects, the Sawyer/Stetson renovations, will commence in 2006 with the building of two new faculty office buildings and a new library at the center of campus. These changes necessitate the relocation of Kellogg house containing the Center for Environmental Studies (CES). This thesis investigates the possibilities of integrating environmental design features into the relocation and renovations of Kellogg, and proposes ways to create a healthier building. This research has been started in the hope that professionals can continue the process of a holistic design approach as an educational tool, but also as a step towards sustainability.

In order to become connected to a project or a problem it's necessary to become immersed within it. This timely coincidence of the moving of CES allowed me to evaluate the Environmental Studies program by looking at its history, current use, and also project my ideas and findings into the future. I started this thesis with a subconscious idea of how Kellogg functioned because I have spent time in the building partaking in many of the functions that occur within the building such as student meetings, class, the library, and meetings with faculty. But in order to explore the social, structural, and environmental issues within the building I needed to dive deeper into the systems functioning in the building.

The Center for Environmental Studies, which is dedicated "to the study of the intricate relationship between humans and their environments, with an eye towards learning how to move towards the future in a savvy yet responsible fashion",[2] became a perfect backdrop to my research.

Conscientiously renovating existing buildings is the most sustainable construction possible because few new resources are necessary.[3] Moving Kellogg house and attaching it to the existing Matt Cole Memorial Library is the best use of the present materials and buildings. An addition is necessary to combine the two current buildings, so my plan to incorporate environmentally sensitive systems and materials will benefit the new building. This thesis sets a guideline that Williams College can use to transform the Center for Environmental Studies into a small-scale test pilot that shows the feasibility, educational benefits, and beauty of integrating sustainable design into an existing building.

Environmental Design

Environmental design can be defined as "any form of design that minimizes environmentally destructive impacts by integrating itself with living processes".[4] This definition encapsulates the need for product designers, architects, and urban planners, to

---

[1] p. 13. Barnett, Dianna, William Browning. A Primer on Sustainable Building. Rocky Mountain Institute, Green Development Services. Snowmass, CO.: Rocky Mountain Institute, 1995.
[2] Williams College: Center for Environmental Studies web page. www.williams.edu/ces/
[3] P. 116 Guiding Principles of Sustainable Design.
[4] P. 18 Van der Ryn

acknowledge and work with the connection between humans and natural systems. By examining the entirety of the building process the integration of disparate parts will create a healthy and well functioning building. Exploration of the history and culture of the specific site are integral to understanding how the new or renovated building will fit and function within the larger context of the surrounding community. Considerations of how the building will respond to changes in the future should be part of the initial design in order to create a building that will have a long life span.

Design has been used to alter our environment and to create a society of growth and development, which has resulted in a diminished understanding of natural systems and their supporting factors. Underlying infrastructure components such as water, food production, and electricity, are often produced outside of our immediate surroundings, and as a result, the consequences of these processes are not within most people's consciousness. Many of the invisible side effects of natural processes can be transformed into celebrated aspects of the design itself. By working with nature's systems and not against them, everyday functions can become more economical, socially beneficial, and environmental sound. Holistic approaches to creating buildings and technologies are needed in our modernized society, and do so in ways that push the ability to become sustainable without the notion of "going backwards" or reducing the quality of life.

Often the concept of environmental design is considered vague and wishy-washy because it's hard to standardize. Unfortunately standards are hard to follow when a building is constructed from very project specific factors such as which local products can be used and the topography of the site. Buildings designed from site specificity meet the needs of the people who utilize them by nurturing healthy, productive, and supportive features.

It's easy to remain focused on economic infrastructure, potential areas for growth, and large-scale environmental consequences, while disregarding the smaller local issues. Humans' ability to comprehend and manage systems has limits, such as my inability to understand the car, pedestrian, and subway circulation within New York City, but I can comprehend these patterns in Williamstown. In order to be effective, designers should focus their efforts to fit within the limitations of our capacity to understand and hence work on the local scale.

Current consumption of natural resources and the idea of development based on economic reasoning that "more is better" has driven our society towards unstable development. Design professionals such as engineers, architects, and city planners, are often forced to standardize due to efficiency and create universal solutions that can then be transferred across large regions, such as cookie cutter houses that are plopped down on suburban lots and positioned to face the road with no relationship to the sun or prevailing winds.[5] These solutions require immense amounts of energy and resources to maintain a level of comfort within the building, but dominate current construction practices. Solutions that are generalized and transferred throughout diverse places cannot take into account the subtleties that are required to create diverse and healthy spaces.

The design process cannot remain focused solely on the final product; it needs to incorporate the entire process from initiation, to material use, to maintenance and life cycle costs. Today, efforts are rising to shift the focus of building towards sustainability. In order to create sustainability, the two disparate sectors of the built environment and the

---

[5] p. 10 Van der Ryn, Sim and Stuart Cowan. Ecological Design. Island Press, Washington D.C.: 1996.

natural environment need to become bound together in intricate ways that create a mosaic of connections that rely on each other and create a unified whole.

Holistic System

The structure of this thesis follows the rating system for the Leadership in Energy and Environmental Design (LEED®), developed by the U.S. Green Building Council.[6] LEED has universalized the building process in order to create a standard for green buildings that can be used across projects. It also promotes integration between green projects, focuses on whole building design practices, recognizes environmental leadership in the building industry, stimulates green competition, raises consumer awareness of green building benefits, and encourages the building market to incorporate green materials.

Founded in 1993, LEED is a non-profit, voluntary, consensus-based process that is transforming green buildings into feasible and well recognized projects. To date LEED has 154 certified projects and 1,778 registered projects. In Massachusetts there are 6 certified projects and 71 registered. In September 2004, LEED published a *Green Building Rating System for Existing Buildings, Upgrades, Operations, and Maintenance* (LEED-EB) because they saw the need to use existing structures and to promote the renovation and reuse of existing structures instead of building anew.[7] Since the onset of LEED-EB there have been 8 buildings certified.

One of the LEED certified buildings in Massachusetts is the Mt. Holyoke College Blanchard Student Center. It was renovated from a 1900 brick gymnasium to incorporate local renewable materials, lots of day lighting, and resulted in a vibrant student center.

Figure 2. Blanchard Student Center, Mt. Holyoke College, South Hadley, MA. LEED Certified Building that was renovated from a gymnasium built in 1900.

[6] U.S. Green Building Council: www.usgbc.org
[7] http://www.usgbc.org/LEED/leed_existing.asp

One of the biggest drawbacks to the LEED system is the extensive documentation necessary to acquire certification, this requires lots of money and time that many clients looking to build or renovate buildings do not want to invest in.[8] The LEED rating system has been used throughout this thesis as a guideline but needs further professional investigation and documentation to become LEED-EB certified.

Ultimately there are faults with any system that tries to categorize large-scale projects and is not grounded in site specificity, but LEED has been a successful development that exposes more people to the issues of Environmental Design. In the United States the environmental impact of buildings, the processes of manufacturing materials to build structures, along with the costs to maintain and run buildings is huge. According to the U.S. Green Building Council, in the United States, buildings including their materials, construction, and life cycles, use:

-36% of the total energy use
-65% of electricity consumption
-30% of greenhouse gas emissions
-30% of raw materials are used in building construction
-30% of waste output comes from buildings
-12% of potable water consumption

It is extremely important to transform the building sector of our society to offset the negative environmental aspects.

Along with the physicality of buildings, there is a need to devote more financial resources towards the schematic design of projects. The design process is integral to the development of environmentally beneficial systems, siting, and massing of buildings. By initially designing with sustainability in mind and a holistic approach, new technologies will be integrated within the building instead of being stuck onto a building to create a cohesive whole. Environmentally conscious buildings should not merely reduce the negative environmental impacts, but should seek to improve the quality of water and air, produce surplus power, and convert wastes into nutrients and useful products.[9]

The value of sustainable design extends beyond the environment, to incorporate educational and cultural enhancement that work to reconnect humans with the natural environment that supports us. By implementing green design and systems into the Kellogg house, it will become a promotion for a type of lifestyle that reduces the impact of the built environment without detracting from a high standard of living. Although many of the suggestions are unable to be termed "sustainable", since outside resources are still needed in the construction and processing of materials and systems, awareness will increase about the feasibility of appropriate technologies, and the implications of energy and waste on a small and local scale.

[8] Personal interview with John Bryant facilities coordinator, Marc Scalauka LEED consultant, Todd Holland energy manager, and Nancy Apple director of safety and environmental affairs. November 17th, 2004. Mt. Holyoke College, South Hadley Massachusetts. Blanchard Student Center room 226.

[9] "What is Green building?" Coldham Architects, LLC. Web page www.coldhamarchitects.com

2. HISTORY

Kellogg House

The history of Kellogg house is one of prolonged importance on the Williams College campus. It was built in 1794 on land given to the college by David Noble for the construction of a president's house. The first location of Kellogg House was on the north side of current Route 2, where Hopkins Hall now stands, see Figure 2. Kellogg faced south, and acted as the president's house until the Sloan House took on that role in 1858.

Figure 3. Kellogg House 1860. Situated with the front door facing south along Route 2, where the current Hopkins Hall now stands. Source Williams College Archives.

Kellogg began its northward migration in 1872 when it moved to the north of the lot and turned 90 degrees to face west, where Stetson Hall currently stands.

Figure 4. Kellogg House 1900. Front door faces west, where the current Stetson Hall is located. Source: Williams College Archives.

In 1919, Stetson Library was to be built where Kellogg stood, so once again Kellogg moved north and turned 180 degrees to face east. This is where it currently stands down the hill and facing the parking lot behind Stetson, see Figure 4. The front porch and side addition did not make the move to the current location. The occupants of the building began with 4 presidents, then later housed professors and student boarders.

Figure 5. Kellogg House 1920, front door faces East on its current location. Shows the old porch, which is now enclosed faculty offices. Source: Williams College Archives.

Figure 6. Kellogg House 1920, front door faces east. The north side of the house had an entrance into the kitchen, which is not there currently. This view is from the current driveway. Source: Williams College Archives.

In 1978 Kellogg was renovated and the Center for Environmental Studies moved in. In 1982, the porch was enlarged and enclosed to house the environmental library, along with extensive renovations to the living room.[10]

Center for Environmental Studies

The Center for Environmental Studies dates back to 1967 when it was officially launched during convocation on October 10, 1967. Andrew J. W. Scheffey was the first director and the Environmental Studies program was located in the Van Rensselaer house, where the current Sawyer Library stands. The center had a community focus from the beginning with the "Berkshire Panel for the Public Environment". In the spring of 1968 there was the first Environmental Studies class offered in "Resource Policy and the Environment". By the fall of 1972 there were 12 courses and a core sequence established for the program. In 1992, 24 courses, including those that are cross listed through other departments, comprised the Environmental Studies Department. In the fall of 2004, there were 31 course offerings in 11 different departments.

The home of CES has a history of being moved due to larger building projects. In the fall of 1973 the Van Rensselaer house was taken down to make room for Sawyer Library, so CES moved to Park Hall on the corner of Park Street and Whitman. This was the first space that CES occupied that established the program as an independent facility and able to accommodate social things relating to the program that included community members. In 1978 CES moved to the newly renovated Kellogg House and in 1982 the

[10] Williams College Archives: 99 Ad8 New Foundations by Dr. Vanderpoel Adriance (Williams 1890), 0-150 "Stories of Old Williamstown" 1945, A Journal: Center for Environmental Studies vol. 10 1993 p. 34-37, Archives and Special collections Photos Files and Card Files, and Campus Maps.

Matt Cole Memorial Library was built on the existing south porch, along with extensive renovations to the living room.[11]

In 1995, the new structure for the Matt Cole Memorial Library was built and attached to the west of Kellogg. The old porch library was renovated to make four faculty offices. Figure 12 shows the plans of Kellogg and the 1995 addition of the Matt Cole Memorial Library, see Appendix B for the construction history of CES. The MCML was designed by Ann Beha Associates, Incorporated, an architecture firm based in Boston.

[11] Rauscher, Marcella. History of the Matt Cole Library. An Environmental Library at the Center for Environmental Studies. January 1993.

3. CURRENT

To better understand the current functioning of the Kellogg House, an understanding of the Williams College campus as a whole is necessary. By understanding the surrounding buildings, academic hubs, pedestrian walkways, and other functions within the college, it will be easier to understand how Kellogg fits into the campus.

Campus

Williams College is located in Williamstown, Massachusetts, on a 450-acre campus with 2,500 outlying acres, including Cole Field and Hopkins Memorial Forest. There are over 100 buildings operated by the college. Williams College currently is home to 271 faculty members, 721 staff members, 1,969 undergraduate students, and 57 graduate students. The top five majors are Economics, Psychology, Political Science, Biology, and Art.[12]

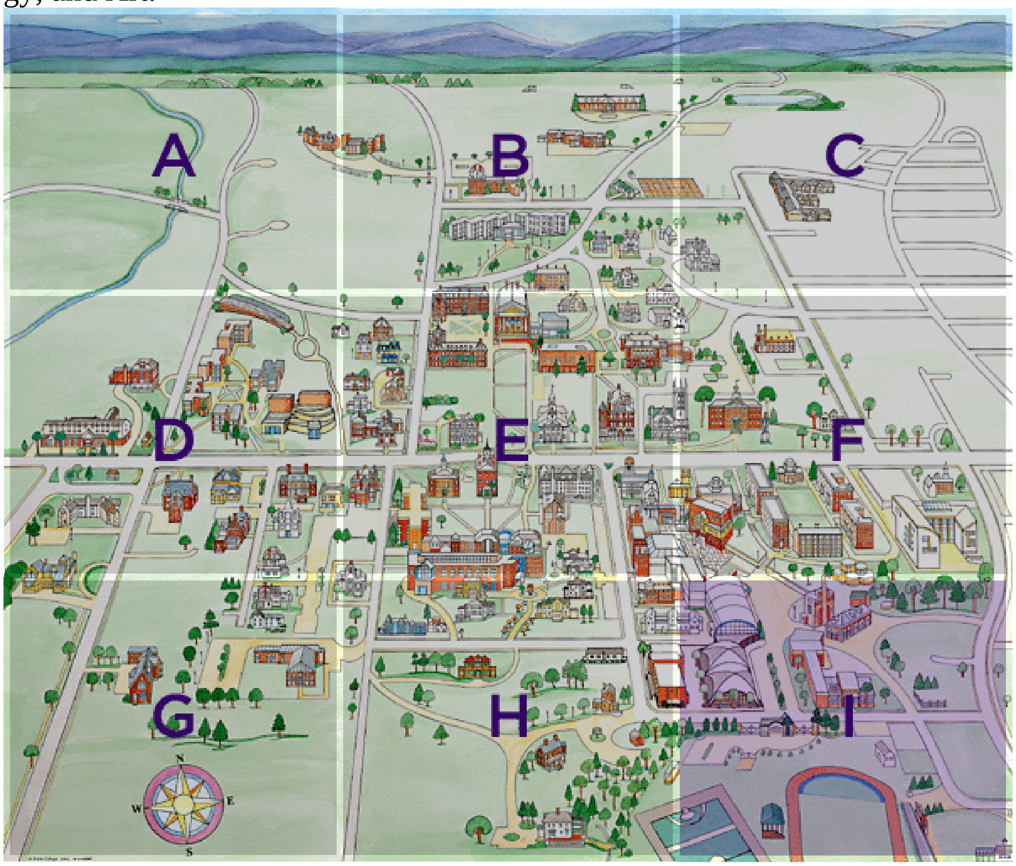


Figure 7. Williams College Campus. Kellogg House is situated in the top right corner of section E. source Williams College web page.

An outside firm, Venturi, Scott Brown and Associates, Incorporated, did a comprehensive investigation of Williams College Campus Planning and developed a statement of the mission, goals, opportunities, problems, issues, and options (MGOPIO

[12] Office of Public Affairs, Williams College, Williamstown, MA. http://www.williams.edu/home/about_fastfacts.php

II). Their goal was to find and document the connections between campus buildings, circulation, and the goals of Williams as an institution of higher education. By investigating the building functions and placement on campus VSBA developed the following division of housing, retail & student services, language arts & social studies (Division 1 &2), science & mathematics (Division 3), see Figure 8.

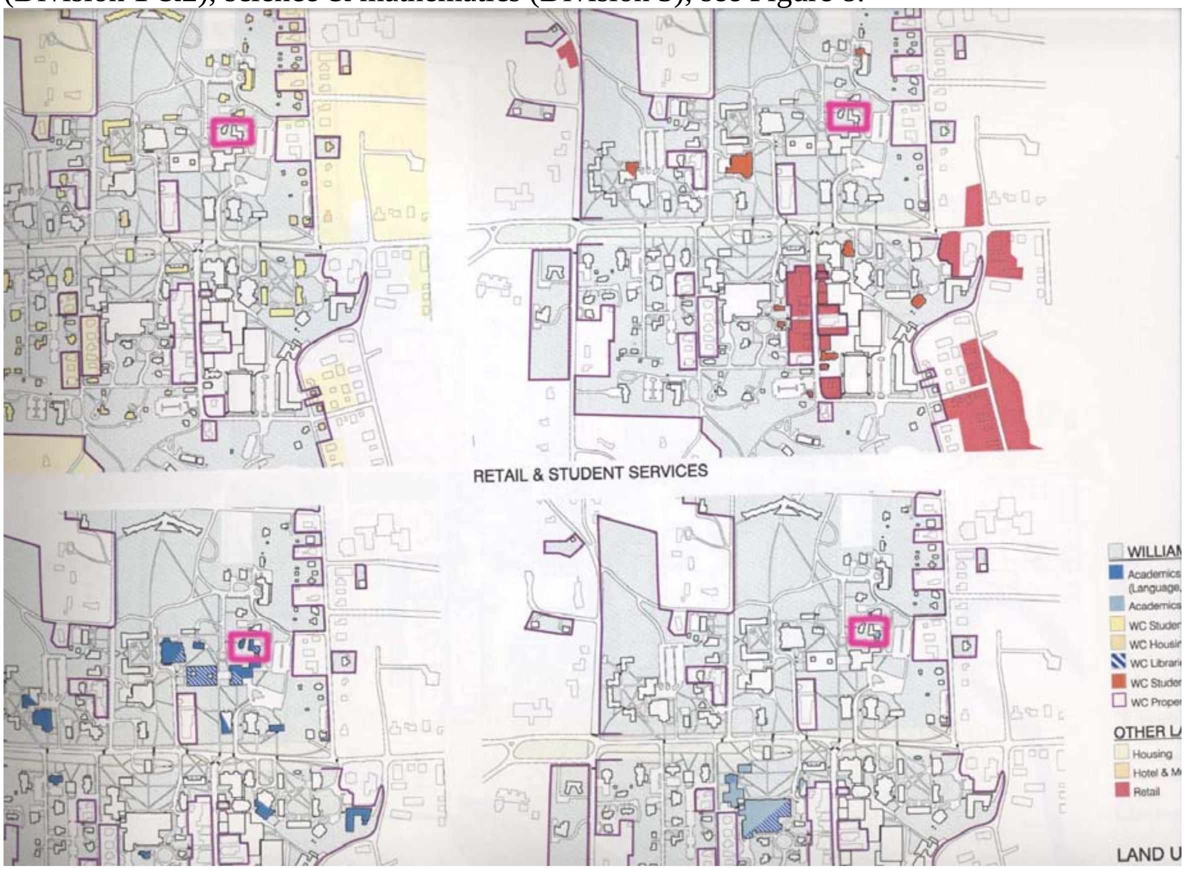


Figure 8. Building Use of Williams College, Kellogg house highlighted in pink. Top left: Housing, top right: retail & student services, bottom left: language arts & social studies (Division 1 &2), bottom right: science & mathematics (Division 3), source: VSBA Campus Planning MGOPIO II, October, 2004. pp. 18.

Kellogg house and namely the Center for Environmental Studies is comprised of all the academic division offered at Williams and thus is tough to determine where it fits with the overall campus layout. The campus is small, with rolling hills, and the student body creates circulation through the central areas of campus while cars and deliveries are pushed to the perimeters. The major pedestrian walkways are north-south, but there is a lack of cohesive east-west movement through campus, except along Route 2, (see Figure 9).

Figure 9. Major Pedestrian Pathways and Walkway, Kellogg house highlighted in pinks, source VSBA Campus Planning MGOPIO II, October, 2004. pp, 25.

After assessing the current buildings, their use, and their cohesiveness with the campus, VSBA created Figure 10, which shows the areas for potential growth, and those of limited to no future change. The dark pink areas are currently in the process of changing, while the light pink areas are future sites of development. The Kellogg house is within the central area of future change. With the current development plans, of the new library behind Stetson, Kellogg will have to move. The area north and east of Stetson is the site of extensive campus improvements, with the new faculty buildings and the new library. This will shift the campus center eastward from Chapin Hall towards the new lawn that will be where the current Sawyer Library stands. Stetson will become the east most façade on the east/west lawn, perpendicular to Chapin Lawn. This shifting campus center is beneficial for CES because Kellogg will become a more noticed entity with the move closer to Sawyer Drive and closer to the academic center of campus.

Figure 10. Potential areas of change, in pink, and areas of no future change, in gray. Source: VSBA Campus Planning MGOPIO II, October, 2004. pp. 36.

Future potential linkages of pedestrians and vehicles are shown in Figure 11. The pink areas again show future building development, while the green shows classic quadrangle lawns, and romantic landscapes near the Kellogg house. For a detailed current site plan around Kellogg house see Appendix A.

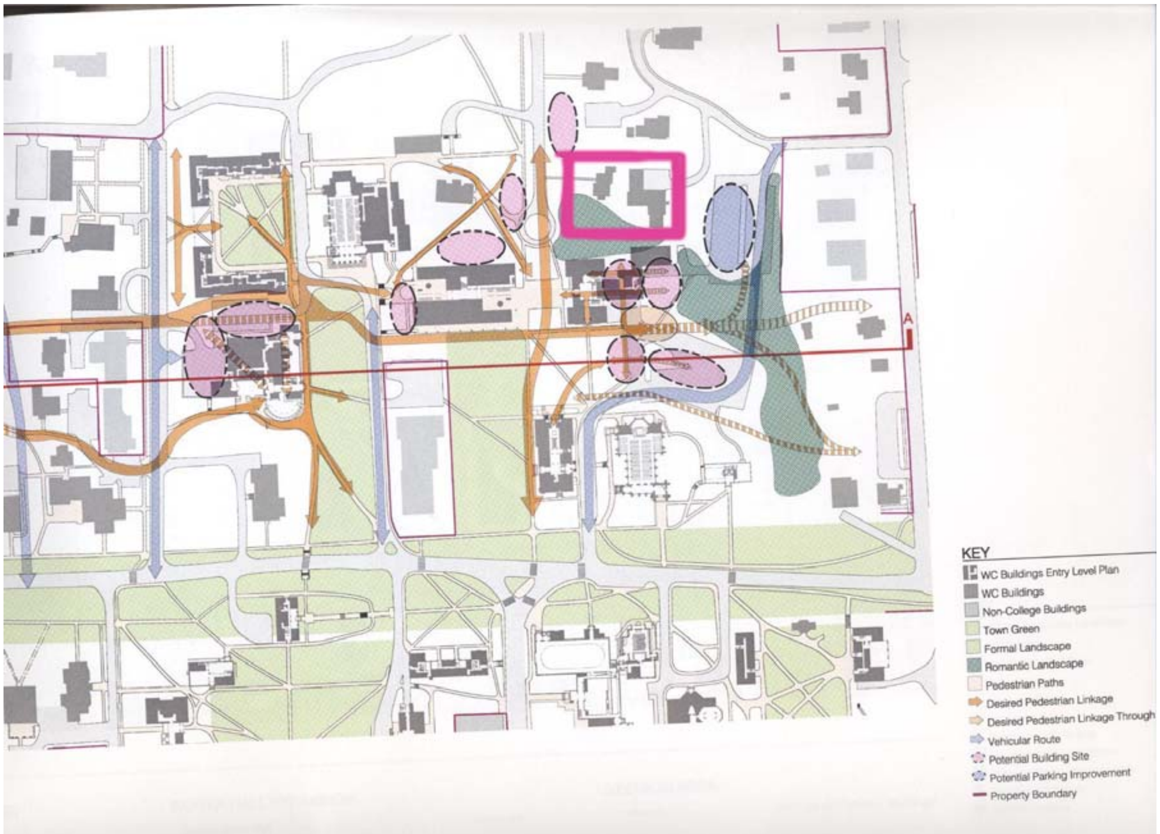


Figure 11. Potential Linkages Site Development Diagram, Kellogg surrounding by pink boarder, area of proposed development throughout campus is in pink, with future pedestrian linkages as orange arrows. Source VBSA Campus Planning MGOPIO II, October, 2004. pp. 54.

Statistical

The current Kellogg house comprises roughly 7,800 square feet, which includes the new addition from 1995 of the Matt Cole Memorial Library. There are nine faculty and staff offices, a student office, a kitchen, two single occupancy bathrooms, conference room, living room, GIS lab, and the Matt Cole Memorial Library, see Appendix C. Unused spaces in the building include one finished room in the attic, additional storage and crawl space in the attic, and the basement.

	Type of Space	Area (square feet)
	Basement	1489
Storage	Attic	1200
Faculty/Staff	Office	1794
	Student Office	220
Student	GIS Lab	529
	living room	510
	Library	1729
	Bathroom	170
Public	Kitchen	170
	TOTAL	**7811**

Table 1. Square footage breakdown into uses of the current Center for Environmental Studies. [13]

[13] Building and Grounds plan of Kellogg house, Williams College, Williamstown, Massachusetts, date issued June 15, 2000.

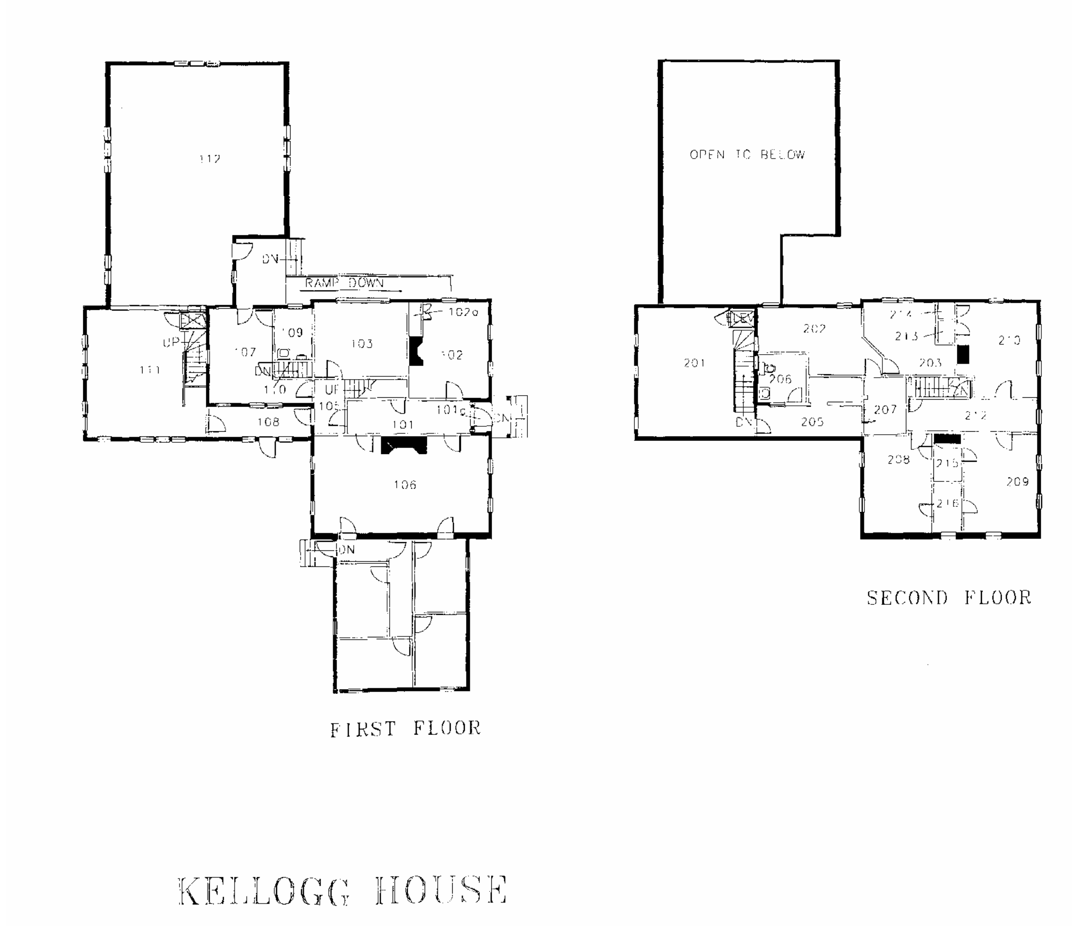


Figure 12. Current Kellogg floor plans. Source Building and Grounds, Williams College. See Appendix B for the area of Kellogg House, Matt Cole Memorial Library, and 1982 porch renovation and Appendix C for the current breakdown of uses within the building..

Building Consumption

Electricity: The college consumes 23 million kwh/year, and the college power plant produces 5 million kwh/year. Williams has a contract with Massachusetts Electric until spring of 2006 where each kilowatt-hour is 8.3 cents. This year the college is buying Wind Power from the Fenner Windpower Project, in Fenner, New York, to supply Kellogg house for the year. The cost is 6 cents per kilowatt-hour above normal.

In 2003, Kellogg house used 27,180 kilowatt-hours, and in 2004 used 26,254 kilowatt-hours. The projection of electricity use in 2004 was 30,000 kilowatt-hours, so the extra cost to buy the "renewable energy" permits from Fenner Windpower Project, came to $1,800 for the year. The total annual price for the electricity used by Kellogg is 30,000 kWh x $0.143= $4,290. The Fenner Windpower Project consists of twenty wind turbines, manufactured by General Electric Wind Energy produce 1.5 megawatts each.[14]

Heating: The new library has radiant heat in a concrete slab floor, while the rest of the building uses old radiators. These systems are hooked up the college's steam system from their cogeneration plant that runs on #6 oil, which the college gets from two sources: Global and Amerada Hess. There are three zone controls within Kellogg. One

[14] For more information on Fenner Windpower Project visit www.fennerwind.com

is located beside the upstairs bathroom that controls the upstairs GIS computer lab, the second is by the back door and controls the downstairs section of the MCML, while the third is located in the basement where the steam channels into the building. It is unknown how much steam is used to heat Kellogg because the college's tunnel system cannot register the amount of steam deposited in each building. Estimates on heat usage of each building, done by Buildings and Grounds, are based solely on the square footage of buildings and disregard the insulation and thermal massing of the buildings.[15]

Water: Williamstown water and sewage department supplies water to Kellogg in ¾" galvanized pipes, with Kohler, and American Standard fixtures.[16] The water comes from underground aquifers and comes to the surface at three pumping stations in Williamstown. Two are located on Cole Field and one is near the Green River and Route 2 intersection. In 2003, Kellogg used 35,000 cubic feet of water at a cost of $296.23, and in 2004, used 32,000 cubic feet of water with a cost of $281.42. The price is a composite of three charges: a water charge, a sewage charge, and a Hoosic water quality charge.

Sewer: Sewage produced from the Kellogg House flows through the town sewer system and makes its way to the Williamstown Sewer Treatment Plant, located along the Hoosic River in northwest Williamstown. The sewage is treated in the conventional way, with removal of sludge, then aeration in large tanks comprising of bacteria and chemicals. The affluent with added chlorine is discharged into the Hoosic River.

Structural

Kellogg foundation is poured concrete, with a wood timber frame on top. The external walls are plank wall construction, with two-inch thick planks and clapboard on the exterior, double hung windows, and an asphalt shingled roof.[17] The roof consists of wooden planks and shingles, but no insulation. Under the floor of the attic there is about six inches of old, loose insulation. The walls are roughly 6 inches thick, and the insulation quality and composition are unknown without drilling a hole in the wall, which I did not do.

The basement is poured concrete 6 feet high, then 2 feet of brick. The window wells are situated in the brick layer. The basement floor plan is an open layout, with two big brick chimneys free standing, and two small rooms located under the current kitchen. The porch from the kitchen door currently covers an egress from the basement to grade. The Basement has a good 7.5 feet of clearance all around.

Matt Cole Memorial Library has a concrete floor with radiant heating. There is ridged 1 inch think closed cell polystyrene foam board insulation beneath the slabs of concrete. The walls contain 6 inches of fiberglass insulation composed of at least 25% recycled glass. The walls have an R-value of 19, and the roof has 9 inches of the same insulation resulting in an R-value of 30.[18]

---

[15] Clark, Don. *Building and Grounds Utilities Manager*. Personal interview September 22, 2004.
[16] Buildings and Grounds Department. Williams College. June 1992-Archives
[17] Williams, Christopher. *Building and Grounds Architect*. Williams College. Personal interview September 29, 2004.
[18] Building and Grounds Department. Williams College. *Kellogg House Expansion*. Section 07210, Building Insulation. June 7, 1994.

Student Use

By surveying students who attended the fall Center for Environmental Studies barbeque, I obtained a range of insights into the use of Kellogg house (see Appendix G for the survey). Some people did not want to take the survey because they don't use the building, but it was important to gain information as to why the building wasn't used along with reasons why it was used.

Of the 30 students surveyed, 24 used the building and 6 did not. The building use was spread evenly between the various functions that occur in the building, from the library, to class, to hanging out.

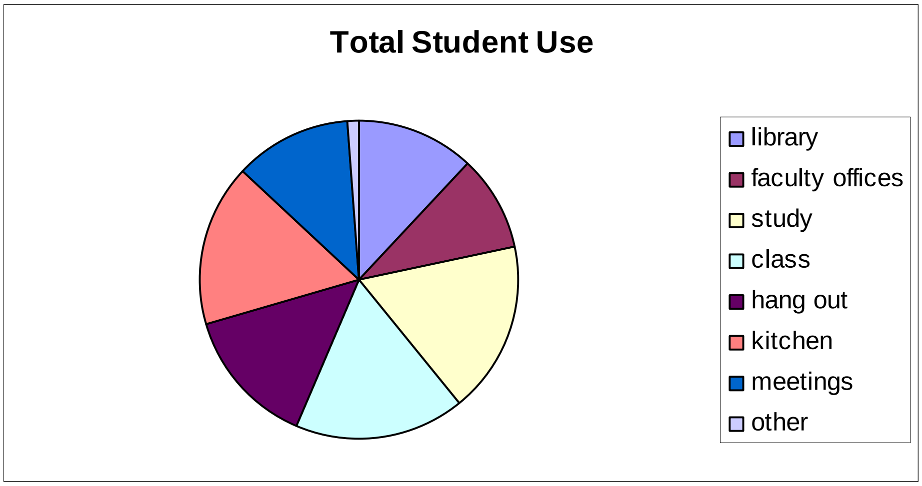


Figure 13. Break down of student use of Kellogg House, source survey given to students.

The majority of people use Kellogg house for 1-2 hours a week and describe Kellogg as a very comfortable place because of its homey feel, comfortable couches, and a kitchen accessible to all students. The few who didn't feel comfortable in Kellogg said it was due to the fact that it is dark and has a confusing layout. When the same people were asked if Kellogg was an inviting place 2/3rds said it was inviting for reasons such as lots of room to socialize, the living room, quietness, and the student run garden. The other 1/3 said it was not inviting because it was too dark, too hard to know where people are, felt like they had to be invited in, didn't know the people who used the space, and most of the hanging out occurs in the library, which in turn creates a loud and unproductive space.

Likes

Many liked that the Matt Cole library has good computers, is an intimate space based on the human scale, and is sunny and airy. The faculty offices are big and clumped together nicely instead of being spread throughout the building. The kitchen is a wonderful asset to the community because it's one of the few on campus that is open to any student, and always has hot drinks available. The forest garden is also a well-loved space because it has slight disorder in a very pedicured campus.

Dislikes

The biggest complaint about the spaces in Kellogg is that more natural light is needed, especially in the living room and kitchen. Another downfall is the lack of study spaces where one can go to escape from the social spaces, which ironically often occur in the library. When there's noise in the computer area you can't get away from it in the library, and there aren't internet jacks besides where the computers are, so it's hard to venture far from this space and use laptops. The faculty offices can be difficult to find because of the split of upstairs and in the south wing. The GIS lab is not well organized and is underused as a student space. The heat within the building is extremely variable due to the old construction of Kellogg and the old radiator system.

Location

The location of Kellogg is beneficial for it's centrality to the main hub of campus, and will be even more so with the new faculty offices extending further north along Sawyer drive and the Stetson renovation to house the library (see figure. . . my site plan). The forest garden is, again, a fitting adjacency for CES. The same number of people liked and disliked the fact that Kellogg was hidden down the steep hill. It shows the mixed feeling from the student body as to the importance of having a prominent place on campus. The faculty in Kellogg house suggested that CES should have a more prominent location and atmosphere on campus. Since CES at Williams is one of the oldest environmental studies program in the nation, it should become an important aspect of Williams academia. If Kellogg were to move, the majority said it should stay central so people could walk through the garden, and notice the building and CES. It should also remain small and not modernized to keep the cozy homelike feel.

Faculty Use

Personal interviews were conducted of each faculty and staff member that uses Kellogg house and came up with the following conclusions:

The faculty and staff want Kellogg to have more through traffic, instead of just being a destination place. Most like the fact that Kellogg has a homey feeling and is not like an office building. Ample opportunity for student/faculty interactions occurs within the space because of the various functions of the building. The multiuse activities, from student meetings, to conferences, to making cookies, are needed in order to draw people into the building and create a diverse array of people and activities throughout the day, and into the night.

More offices would be beneficial for CES in order to house visiting faculty and possible second offices for current professors who teach Environmental Studies courses but are located in other departments. Drew Jones, Hopkins Memorial Forest Manager, and Sara Gardner, assistant director and lecturer in Environmental Studies, need to have offices in CES because it creates connections with the external programs in the department. The current south wing is hard for students to find, but is also beneficial for separating retired faculty. The bathroom placement in the kitchen causes accidental interactions, but having a bathroom off of a kitchen is against health codes, so this should be changed.

There is interest in having the Matt Cole Memorial Library become part of Sawyer or Schow collections, in order for the resources to get used more. Currently there are security issues with the collection because MCML does not have the devices used in the other libraries so books tend to be taken from the library without properly checking out. Also the space is used more in terms of a computer lab and social space than a library, which dissuades people from studying in the library space.

Conclusions

Important aspects of the current Kellogg house that should be maintained in the relocated Kellogg are the homey feel, the kitchen, the living room, the central location on campus, and the various functions of the building, which are necessary to draw people in during diverse hours of the day. The results of the student survey show that some people's likes are others dislikes. This is the nature of any building or situation where people's opinions are involved. I have incorporated the issues of Kellogg house into the decision process of relocating, renovating, and redesigning the spaces within it.

The most important findings from this analysis are the things that can enhance the comfort and functionality of the spaces within Kellogg house. More natural light is integral to a healthy building and makes the inhabitants happier and more productive. A more prominent and accessible entrance will help to create the feeling that CES is an inviting place and open for anyone to pass through. In order to entice students into the building, spaces need to be created that are public and separate from the study spaces. By creating new spaces that facilitate the multiuse of the building, but does not deter from the house feeling, more people will want to use CES as a place to study and interact with people.

4. SITE

During this substantial change to campus the Kellogg house will be in the way of the new library east of Stetson. Bohlin Cywinski Jackson (BCJ) are in charge of moving Kellogg and reattaching it to the Matt Cole Memorial Library, which is poured concrete slab floor, so cannot be moved without demolishing and reconstructing the floor. The following assessments of CES and the needs of the program, now and in the future, will help to determine the best reconfiguration of Kellogg.

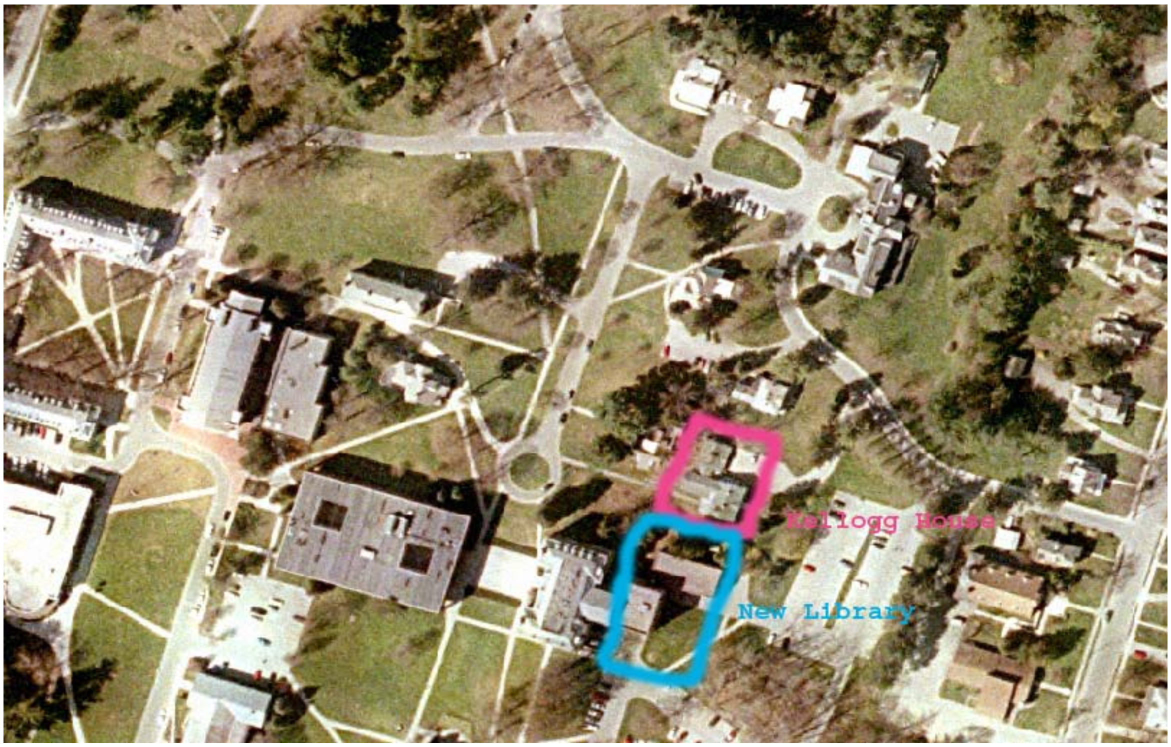


Figure 14. ½ Meter resolution Orthophoto of Williamstown, MA. Mass State Plane. Kellogg House highlighted in pink, the site of the new library highlighted in blue.

The future development of the Stetson/Sawyer project will alter the central library and faculty offices at Williams (Appendix E). A new "North Faculty Building" will be constructed as soon as 2006, just north of the current Sawyer library. Once this building is complete the faculty will move out of Stetson and into this north building, then the back part of Stetson will be demolished. The old part of Stetson, built in 1919, will remain and ultimately become the end of an east-west lawn where the current Sawyer library now stands. The new library will be constructed behind the old Stetson and once completed the book collection will be transported into that space. Upon emptying of Sawyer library, it will be demolished and the basement will be covered as additional book storage. Another faculty office will be built on the south side of the current Sawyer library and thus close in an east-west quadrangle that terminates at Stetson.[19]

[19] Bohlin Cywinski Jackson Architects for the Sawyer/Stetson project, open campus presentation November 16, 2004. Stetson Faculty Lounge, Williams College, Williamstown, MA.

Kellogg-Built Site

The current location of Seeley house, planned to be demolished during the Stetson/Sawyer project, is an ideal location for the placement of Kellogg house. This will minimize land disturbance and need to excavate a virgin site.[20] The Kellogg house can be rotated along the south side of the Matt Cole Library and turned 180 degrees so the front door will face Sawyer Drive. This can be accomplished with minimal grade change, tree removal, and power line disassembly because the south side of the site will already be disturbed due to the new library construction, see Appendix A for the current site plan and Appendix B for the future site plan. The trees surrounded by red will need to be removed, and the trees surrounded in yellow will need to be planted.

The front door of Kellogg facing Sawyer Drive will once again become the main entrance to the building. Consequently it will create the feeling of formality, while providing easy access to the building. A more cohesive configuration results by lining Kellogg house up with Stetson and Goodrich house. By bringing Kellogg further north and west it has the ability to rise seven feet in grade, and thus will reduce the steepness of the hill that people must come down to enter Kellogg, currently a daunting and dangerous task.

This move will help create a more established presence of the Center for Environmental Studies on the Williams College Campus. Kellogg, positioned across from the new "North Faculty Building", will remain connected to the large academic hub of the campus, while maintaining its own entity and no particular affiliation with any department or academic division. This separation, but close proximity, to the other academic departments is important for the Environmental Studies program at Williams.

In choosing to connect Kellogg's placement with the surrounding buildings, a relationship is created with Stetson, Goodrich house, and the new North Faculty building. This is necessary to ensure the ordered application of building placement around Williams College campus. This limits the position of Kellogg because it must relate to the surrounding buildings.

Natural Site

It is desirable to work with the natural attributes of the site instead of against them. There is a slight grade change from Sawyer Drive to Kellogg House, which can be beneficial in creating a buffer from the northwest winds that prevail during the cold winter months. By planting red cedar, *Juniperus virginiana*, to the north and west of Kellogg a natural barrier will help reduce the winds hitting and cooling Kellogg. Red cedars are a good choice for the wind buffer because they have a terminal high close to 30 feet and will not grow too tall and gangly like white pines, which loose their ability to block the wind. Red Cedars will also maintain their landscaping appeal and enhance the area around Kellogg House.

The "romantic"[21] feel of the area surrounding Kellogg is a distinct part of campus because it contains the student run Forest Garden, sporadically placed trees, and a more unruly vegetation than the pedicured greens around campus. According to the people

---

[20]Barnett, Dianna, William Browning. A primer on sustainable building Rocky Mountain Institute, Green Development Services. Snowmass, CO : Rocky Mountain Institute, 1995.

[21] Term used by Venturi Scott and Brown Associates to describe the area around Kellogg house, Campus Planning MGOPIO II, October, 2004.

surveyed in and around Kellogg, there is a draw towards this type of landscaping because the vegetation is wilder and also because students can have their input into what is planted and grown. The new landscaping around Kellogg needs to have space for the Forest Garden, large trees, and a planned disorder.

As shown in my site plan, Appendix B, deciduous trees should be planted to the south of Kellogg and surrounding the parking lot. This will reduce the summer sun penetration on the roof and asphalt parking lot, and in turn reduce the summer heat gain. While during the winter, the leafless trees will allow the low winter sun to penetrate the building and take advantage of solar heat gain.

No new parking spaces will be needed in the relocation of Kellogg, so the current parking lot should not be altered, because the act of removing and changing the asphalt will be an energy intensive operation and unnecessary. A future plan is to build a parking garage in the existing parking lot to the east of Kellogg. This will benefit the site because in the need for more parking, a grass area will not need to be paved over, instead the same area of impervious surface will be present and be able to park two or three times as many cars. If possible, putting all of the parking, including the small lot to the north of the site near Goodrich House, into the large east parking lot will benefit the center of campus by creating a central greenway without cars.

Appropriately placed footpaths to and around Kellogg can rectify erosion that results from foot traffic killing vegetation. Currently the pedestrian flow must venture through Kellogg or around the north side on a small, poorly marked path in order to walk around the building. Often the "front door" and door by the kitchen are locked so it's necessary to bushwhack around the building to get inside. This makes Kellogg an uninviting space and a frustrating building to use.

In the future plans, a main pedestrian walkway will exist between Kellogg and Stetson, connecting the parking lot to the central campus and the front entrance of the new library (see site plan). This can easily have an offshoot path that goes directly to the side door of Kellogg, where the greenhouse and public space is proposed in my design. A sidewalk flanking the east side of Sawyer drive will help with the pedestrian flow through the area, and the front door of Kellogg will be connected to this path. Kellogg's parking lot will remain the same, and the faculty access to the building will primarily be through the new door on the north side of the addition. This is a smaller entrance, but is situated across from the public pedestrian entrance in order to create a transitional space between the public meeting places and the quiet study spaces.

Accessible bike racks will be placed near each door, therefore promoting alternative transportation to the building. People who bike to the building will be able to store their bikes in an easy and accessible place. Currently the one bike rack is hidden down grade from the main student entrance and is rarely used. To promote alternative transportation, CES should continue to rent the hybrid car from Building and Grounds and encourage them to include more hybrids in the fleet of school cars. Faculty should walk to work or carpool when applicable.

The current outdoor classroom, in front of Seeley House, that consists of a dozen stumps beneath the white pine trees is an important aspect of the site. Especially with the faculty and classroom building shifting northward there will be a greater demand for outdoor learning spaces. By keeping a space to the north and west of Kellogg house a quiet outdoor space can be created to facility outdoor classroom meetings. The black locus, *Robinia pseudoacadia*, trees currently between Seeley and MCML will need to be cut down and would make great benches or stump seats for this new outdoor classroom. For smaller group meetings the south door by the greenhouse will have ample room for small classes to meet, such as tutorials, in a protected and south facing courtyard.

"Green" Site

As stated by LEED standards for Existing Buildings, precautions during construction to reduce erosion and consequently the negative impacts on water and dust in the air. This can be achieved with silt fencing, sediment traps and sediment basins during the relocation of Kellogg. The removed fill from the newly excavated basement should be put in between Kellogg and Stetson to lessen the topography of the steep grade directly to the north of Stetson. The current vegetation on the slope to Kellogg helps to maintain the soil stability of the area due to its diverse and abundant species. During the immediate relocation of Kellogg there will be a negative impact on the species present on the site, but afterwards the Forest Garden will benefit from the move because it will be able to expand north and west (see Appendix E).

The site around Kellogg will continue to have a variety of plants, mostly native, which will reduce the lawn size and the resulting need for maintenance power equipment, such as lawn mowers. The management practices around Kellogg are similar to the rest of campus, except that the mowing is left up to the CES staff and Forest Garden students. The reduction of power equipment is important to reduce emissions and the use of gasoline, but mulching mowers can help retain nutrients on the site, so some mowing can benefit the area. Fertilizer is on a need basis, currently there is a compost pile on the north side of Kellogg which is fueled by the Forest Garden weeding and CES food scraps. Most of the nutrient waste from the site can be contained and circulate on the site. This is an important aspect to the site and must continue.

Stormwater

Roughly 2/3rds of the site around Kellogg is a pervious surface, and 1/3rd is impervious roof and parking area, therefore much of the storm water flows back into the ground. The water that is not absorbed by the ground runs into the Williamstown sewer system and eventually is treated at the Williamstown Sewer Treatment Plant. Annual rain fall in Williamstown is 43 inches, and during May-August it is roughly 15 inches, so by capturing the runoff from the roofs in a barrel during the spring and summer months, the stored water can then be used to irrigate the Forest Garden throughout the summer. Captured water could also be used to flush the toilets by putting in through a rudimentary filter system and hooking up the toilets to the water catchments. Groundwater recharge, the use of the storm water in the building for flushing toilets, or constructed wetlands, all seem excessive for the small site, but should be considered in terms of creating a fully sustainable site and an educational tool.

Solar

The sunlight hours affects this site drastically, especially considering its northern climate where there is a low sun altitude for much of the year and during the coldest months. The new library will protrude northward towards Kellogg and be at the highest 63 feet (no higher than the top cornice of the old Stetson). There will be drastic shading to the site around Kellogg. To date, the new library footprint comes within twenty feet of the edge of the Matt Cole Memorial Library. The plan is to demolish the southern square that contains the computer lab and upstairs GIS computer lab, and build a new space for those functions north of the MCML. In my plan, the southern edge of the Kellogg house will be 80 feet from the library and allow for direct sunlight to reach Kellogg most of the year except during November, December, and January. See the sun section for further analysis.

5. SUN

Sun influences productivity, mood, and even health. It is a means to regulate, guide, and alter human understanding of the daily cycles around us. By having naturally lit places occupied by humans, the connection between the outdoors and the indoors is created and enhanced.

The immense amount of sun penetrating the earth daily should be a critical factor when building. Buildings are affected by the sun through orientation, windows, and can have passive and active ways of harvesting energy from the sun. Buildings originally took advantage of the position of the sun and designed accordingly, such as Mesa Verde, a 1000-year-old adobe structure where the dwellings are oriented towards the sun, have protection from the prevailing north winds, and have a large overhang to keep out the summer sun.[22] In the past century, the design of buildings has disregarded the position of the sun, due to cheap and abundant fossil fuels which have been able to overpower the natural processes.

The sun provides the earth with energy in the form of visible light and infrared rays. When these light waves hit an object, a portion of the waves is transformed into heat energy then stored in materials. An efficient ways of harvesting energy from the sun is through the green house effect. Once the sun's waves penetrate glass it becomes heat energy that is composed of long wavelengths and cannot be emitted back outside. The heat energy can be stored in a dark surface for release later since sunlight is usually abundant during times when the heat is not as needed. By creating walls and floors that can absorb the heat and slowly release it into the night, this will help maintain a constant temperature inside the building.

There is a plethora of methods for passive and active solar heating, with the main components being large south facing glass walls with storage walls behind. The ability to manually open and close windows is important manually regulate the temperature and reduce heat gain during unwanted periods. An overhang along with properly placed deciduous trees will also help keep out the direct summer sun.

One of the biggest complaints about Kellogg house is the lack of natural light and the irregular temperature in the building. This is partly a result from the New England style house built in the 18th century with small windows and poor insulation. But this is also due to the poorly designed renovation of the south porch into faculty offices that now prevent the south side of the living room from containing windows and gaining solar heat. The southern exposure is a valuable resource that is not being used in this case.

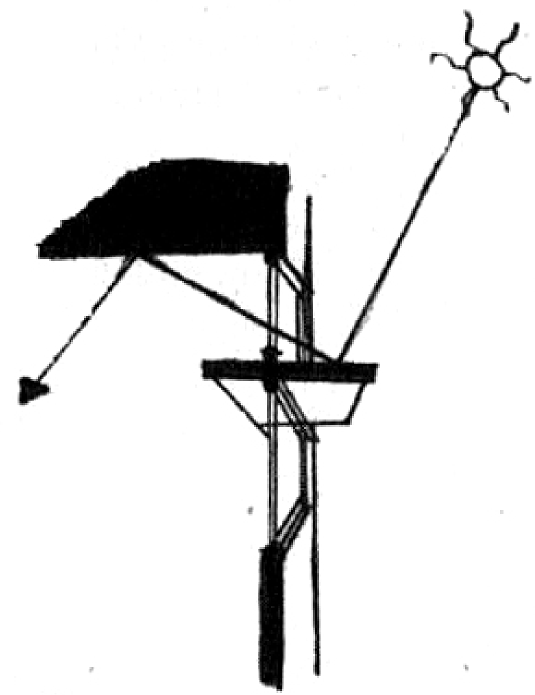
Natural light creates a far superior quality of light than any manufactured light can produce. When windows are properly placed, with the majority on the southern wall and minimal windows on the north walls, it also reduces overall operational costs of the building to have day lighting, and even produces a better sense of well being of the occupants.[23] The way light enters a room is an important factor of its success as a lighting tool. To get light deep into a building one can use skylights, large windows, clerestories, light shelves (Figure 14), atria, courtyards, and light colored paints and

---

[22] P. 54 Kraushaar, Jack J. Robert A. Ristinen. Energy and Problems of a Technical Society. Second Ed. John Wiley and Sons, Inc. New York. 1993.

[23] An arbitrary conclusion based on the surveyed students desire to have more natural lighting instead of merely more lighting. It's also a noticed human behavior to tend toward naturally lit places.

furnishings.[24] Due to the small size of Kellogg, complicated technologies are not necessary to insure that ample natural light gets into the building. The proposed window placement allows for light into all the rooms and areas.



An example of a light shelf that indirectly bathes the interior in glare-free natural light while shading the view glass from direct glare.

Figure 15. Light shelves, a way to bounce light onto the ceiling and penetrate light deep into a building. Source: p 43, A Primer on Sustainable Building.

Site With Regard to the Sun

The orientation of Kellogg house is integral in connecting it to the campus, but the sun needs to be given consideration about how it affects the function of Kellogg and its ability to provide comfort for the occupants. A properly sited house will gain heat in the cold winter months, and be shaded during the summer. By positioning the building with a long access facing south it enables the building to gain the most energy possible from the sun. The west side should be the shortest due to the immense summer heat gain in the late afternoon. The northern length of the building should have the least amount of windows because of the heat loss from them, and does not have ability for direct solar gain.

Given the above considerations, Kellogg house would still be best positioned facing west in order to give the front façade prominence and a connection with the academic campus. The additions will then connect the back "working" areas of the building to the Matt Cole Library in an east to west linear configuration. This will allow

[24] P. 43. A Primer on Sustainable Building. Rocky Mountain Institute. Green Development Services, Dianna Lopez Barnett and William d. Browning. 1995.

for a courtyard and greenhouse to become integrated on the south wall of CES. By creating a conglomeration of the multiuse aspects of the CES, a building that functions well with the site, its occupants, and the environment will result.

The affect of the new library being built behind Stetson has great importance on Kellogg's ability to use the sun for solar heat gain throughout the winter months. Sun diagrams were constructed to determine the affects of the new library on the site, see Appendix F.

time	Altitude (degrees)	Azimuth (degrees)*	Sept&March 21 Length of east edge Shadow (ft)**	Length of west edge shadow (ft) ***
9:00 AM	34	53	93	56
12 noon	48	-6	57	34
3:00 PM	30	-59	109	66
			Dec. 21	
9:00 AM	13	40	272	164
12 noon	24	-2	141	85
3:00 PM	11	-43	324	195
			June. 21	
9:00 AM	49	76	55	33
12 noon	71	-3	22	13
3:00 PM	47	-78	59	35

* Azimuth=0 at due South
** Length of the east edge shadow is calculated using the height of the new library as 63 feet. =63/Tan(altitude)
***Length of the west edge shadow is calculated using the height of Stetson as 38 feet.

Table 2. Shadow calculations of the affects of the new library on Kellogg house. See Appendix F for sun diagrams.

Currently the plans for the library have it protruding northward to within 20 feet of the computer lab in the MCML.[25] In order to get sunlight at noon on December 21st the top edge of the new library cannot be over 35 feet tall, but the proposed plan have the library being 60 feet tall directly south of Kellogg. Hopefully BCJ Architects working on the project will consider the sensitivity of the site north of Stetson and the affect of their new buildings on the Center for Environmental Studies. The library could be massed further east, instead of northward, and still get the same views desired of the northern mountains.

The sun has potential to power the building through the use of photovoltaic panels positioned on the south facing roofs, as long as the new library does not shade Kellogg and the addition. The hot water needs of the building can also be achieved with the aid of solar thermal heating, (see the Energy section for more information). Although many of these initiatives will not be cost efficient in terms of payback, it could take up to 40 years to come out even with the initial investment versus the savings. Still, these initiatives should be considered based on the premise that the Center for Environmental Studies has a mission to incorporate sustainability into their teaching.

[25] BCJ public presentation, November 16, 2004. Stetson Faculty Lounge, Williams College, Williamstown, MA.

Designing for the Sun

A greenhouse is planned along the south side of the addition. Seedlings can be grown for the Forest Garden and is a potential area for the Living Machine tanks that cleanse the building's sewage using plants and bacteria (see the water section of more on Living Machines). The greenhouse should have thermal massing along the north wall to store heat, along with the floor throughout the first floor. This massing should be a local stone, such as slate from Poultney, Vermont, or even bedrock that is excavated from the site. Adjustable shading for the summer months and operable windows to allow for temperature regulation are necessary in greenhouses attached to buildings. This greenhouse will be connected to the public space and entrance area, but will be able to be closed off from it in order to maintain a higher temperature in the greenhouse. The angle of the glass in the greenhouse will have an angle of thirty degrees, because this is close to the optimal pitch to capture the most sun energy at Williamstown latitude of 42 degrees.

A balcony/walkway along the second floor will be open to below and the south facing windows. An outside overhang of the roof will shade the second floor windows during the summer months, along with operable windows to help cool the building during the summer. The walkway open to below will allow for natural air circulation through the building with the heated air rising to the second floor.

6. ENERGY

A building should be like a tree, it should thrive on the sun's energy, while enhancing its surroundings. –Williams McDonough, Architect, 1993[26]

In stable ecosystems, water, nutrients and energy are efficiently recycled through various components and organisms. Little energy is wasted as heat in the process, and few resources end up in unusable states, so ecosystems are able to curtail many of the consequences that result in entropy, which is the tendency for things to move from a highly ordered and stable energy state to one of disorder and low energy. Through structural and dynamic order, recycling of materials, complexity of systems, and little wasted energy, ecosystems are able to minimize entropy and create functional, regenerative systems. In order to strive for sustainable human-built environments, it isn't necessary to copy the appearance of nature, merely use principles of the interdependent and efficient structures found in natural systems.[27]

Energy reaches the planet from one main source, the sun, and can be captured by the earth in water, plants, rocks, etc. Fossil fuels are produced by the storage of plant and animal matter deep inside the earth. The current use of these fossil fuels is cheap but large amounts of scientific research have stated that burning fossil fuels has increased the carbon in the atmosphere and consequently change the global climate.[28] Consequently, it seems necessary to develop clean energy sources that do not add carbon and particulates to our atmosphere.

The heat for Kellogg house comes from the Williams College cogeneration plant. During the process of converting oil to electricity through steam turbines at the power plant there is a large amount of "rejected heat", which is perfect for space heating throughout the institution. This excess steam is pumped through tunnels throughout campus and ultimately through radiators that heat most of the buildings on campus. The college recently put in a new cogeneration steam turbine that is more efficient at capturing the excess heat that results from producing electricity.

As for Kellogg, it is impossible to figure out the amount of steam heat, and consequently the amount of oil and energy required to heat the house throughout the year because it is hooked up to this central system. The projected amount of heat per square foot that is used throughout the campus is inaccurate for Kellogg because of its poor insulation, old construction, and poorly circulated heat so one room requires that a window be open in the winter to expel excess heat, while in the next room, the occupant needs to wear two sweaters to stay warm.

In terms of heating the future Kellogg house, passive solar aspects should be incorporated into the new design. Unfortunately the new library plans to date will come within 20 feet of the Matt Cole Memorial Library and 80 feet from the relocated Kellogg House. Consequently much of the solar access to the site will be blocked during the critical winter months. The majority of the new windows will be placed on the south side

[26] p. 75. Barnett.

[27] Thayer, Robert L. Jr. Gray World Green Heart: Technology, Nature, and the Sustainable Landscape. John Wiley and Sons, Inc. New York. 1994.

[28] Intergovernmental Panel on Climate Change. Climate Change 2001: Mitigation. Section 3.2 *Trends in Energy Use and Associated Greenhouse Gas Emissions*. www.ipcc.ch/index.html

with internal stone walls and floor to store energy from the sun. The northern side of the building will have small windows and the entire house needs more insulation. The existing windows should be caulked and weatherized. Additional insulating storm windows should be installed to create airspace between the windows, which helps reduce the heat loss.

Heat energy will move through conduction from areas of higher temperature to areas of lower temperature. Materials vary as to how well they can conduct heat. A material's thermal conductivity is the rate of one Btu/hour/square foot/degree Fahrenheit to cross 1-inch of the material, (see Table 3).[29] R-values of materials indicate the resistance to heat transfer by conduction, and the higher the R-values the higher the insulation capacities. Windows are often rated with a U-value, which measures the conductance rather than resistance of heat transfer. The better insulating windows have lower U-values.[30]

The movement of gases or liquids transfers heat primarily through convection, the motion of air through regions of different temperatures. This can occur by force with a fan, or through natural movements of heat rising. Most heating systems take advantage of this natural movement, and heat the air at the bottom of the room, which rises and the cooler air takes its place to be warmed.[31]

The storage of solar heat through thermal masses is the most efficient way to capture and store this energy. Different materials have differing heat storage capacities, and different requirements of btus needed to raise the temperature of 1 pound of the material up 1 degree Fahrenheit, which is the specific heat of a material.

Material	**Specific Heat (Btu/lb* degree F)**	**Density (lb/ft^3)**	**Volumetric Heat Capacity (Btu/ft^3* Degree F)**	**Thermal Conductivity (Btu*in./hr*ft^2*degree F)**
Water	1	62.4	62.4	4.2
Iron	0.11	490	54	320
Glass	0.2	170	34	4
Stone	0.21	160	34	3
Stone, loose	-	-	20	-
Wood, oak	0.57	51	29.1	1.4
Ice	0.46	57	26.2	15
Brick	0.22	112	24.6	4.6
Concrete	0.156	144	22.4	12
Wood, pine	0.67	31	20.8	0.7
Sand	0.195	100	19.5	2.3

Table 3. Heat Storage Properties of some common materials. Source: Kraushaar, Jack. Energy and Problems of a Technical Society. p. 159.

The conductivity of materials is important in terms of the time it takes to heat up a storage wall, and consequently the time it takes to release that stored heat back into the room. As shown in the Table 1, wood has a thermal conductivity of 1.4 Btu*in/hr*ft^2*F, while concrete has 12 Btu*in/hr*ft^2*F. This means a wooden storage wall will take

[29]P 151. Kraushaar
[30] p. 22. Heede, Richard. Home*made Money*. Rocky Mountain Institute, 1995.
[31] p. 155. Kraushaar

much more time to store and release the same amount of heat than a concrete wall of the same thickness. The material for the thermal massing within the Kellogg house connection to the Matt Cole Library should have high thermal conductivity to store the largest amount of thermal heat and have air spaces so that convection can occur within the massing to help circulate the store heat back into the air, while being made from a local and a material with low embodied energy (see Materials section for more information).

Reduce Heating Needs

Each year in the U.S. about $13 billion worth of energy-in the form of heated or cooled air escapes through holes and cracks in residential buildings.

–American Council for an Energy-Efficient Economy[32]

An energy audit on the Energy Star web page indicated some small changes that can reduce the energy needs of Kellogg house. The EPA estimates that a programmable thermostat can save 20-30 % on heating bills when used properly. Programmable thermostats can maximize energy saving by continually monitoring weather conditions to determine the best time to reduce the system input in order to reach the next desired temperature setting. For example, the temperature can be reduced to 55 degrees Fahrenheit during the night or days when people are not present. The typical added cost to install this thermostat is $190-$245, but can save up to $600 a year due to decreased heating during unoccupied times.

Testing and sealing leaks in the house has potential to decrease yearly heating costs by $1,000, according to the Energy Star web page, but through examining Kellogg these savings could be four times higher. Heat escapes from buildings that have air leakage, which is most commonly found along windows, doors, fireplaces, foundation, and attics. The building shell should be tight, so little leakage occurs. The first step to creating a tighter Kellogg house is to seal all leaks throughout the building. By paying close attention to the basement and attic, the circulation, caused by convection, of cold air into the house through the basement and warm air escaping out of the attic, will be reduced.[33] Attic insulation should be increased to R-55, and the basement ceiling should be at least R-19. [34]

Fireplaces, although aesthetically pleasing and a wonderful aspect of Kellogg house, often add to this influx of cold air into the building and letting hot air escape out of the chimney. A fireplace should always have a damper on it so when the fire is not in use hot air does not escape out of the chimney. In order to have a fireplace that is efficient at heating a space, two components of its construction are necessary. One, fire needs oxygen to burn, so a direct air draw from outside into the fire will reduce the cooling effect of the fire pulling cold air into the building through cracks. Secondly, a mechanical means to pump heat out of the fireplace into the building is needed to effectively heat a space.[35]

---

[32] p. 45 Barnett
[33] p. 21 Heede
[34]p. 9 Heede
[35] Peterson, Jeem, interview December 17,2004. Cobb Hill Co-housing, Hartland, VT.

The main source of wasted heat in Kellogg is due to the inefficient heating in the old part of the house. One room is often too hot while others are too cold. The entire heating radiator system in the house should be removed during renovations and energy star new radiators should be installed. This will have high initial costs, but will save the college immensely in terms of increased efficiency.

Electricity

The real cost of electricity cannot be portrayed solely in the bill, as there are also immense environmental costs such as urban smog, polluted ground water, oil spills, and acidified lakes. These costs cannot be easily quantified, but need to be recognized when choosing the supplier of electricity.[36] Fortunately, Buildings and Grounds at Williams College has recognized these less tangible costs and has agreed to buy the more expensive (6 cents more per kwh) electricity from wind power to run Kellogg House for the year. Hopefully this will continue and expand, possibly to the College's own wind power farm on Berlin Mountain, but if not, continuation of purchasing green energy should be put into the college's budget for successive years.

Kellogg used 27,180 kwh in 2003 and 26,254 kwh in 2004, and is mainly used for lighting and computers. Compact fluorescent light bulbs are in most fixtures since they use ¼ as much electricity as an incandescent lamp, which creates excessive heat energy instead of more light energy. Compact fluorescent light bulbs can be screwed into standard incandescent fixtures and can even be used outdoors if they're protected from the weather. Although slightly more expensive ($5 to $7), if the light is on more than six hours a day the pay back period will be two years, and they last eight to ten times longer than incandescent bulbs.[37] According to the Center for Ecological Technology located in Pittsfield, MA, one 15 Watt compact fluorescent light bulb eliminates the need for 400 pounds of coal or almost one barrel of oil, and 600-800 pounds of carbon dioxide emissions throughout its lifetime.[38]

Lighting must be designed according to the space and occupants' tasks. Glare-free and well-distributed natural lighting will minimize the need for electric light and will produce a more productive space. The biggest complaint with the current CES is the lack of natural light and task lighting in the living room. Motion sensors should be installed in all of the rooms so that unoccupied spaces will not be lit unnecessarily. In the study spaces on the second floor of the addition, there should be task lighting, while in the computer lab and entrance hall there should be overhead lights. Outdoor motion sensors will benefit the walkway down to Kellogg and help to make it feel welcoming to the students entering the building.

Hot Water

The Kellogg House has its own hot water heater, an A.O. Smith Conservationist '90 style, which is heated by electricity. It has a foam insulation that has an R-value of 16. Currently with the price of electricity for Kellogg house at 14.3 cents/kWh the price to heat the hot water tank is about $661 per year.

---

[36] p. 12 Heede
[37] Center for Ecological Technology (CET). Pittsfield, MA. www.cetonline.org
[38] CET: http://www.cetonline.org/Home/Compact_fluorescents.htm

Price of electricity cents/ kWh	yearly cost to heat Kellogg House water
6	$283
8	$378
10	$472
12	$567
14	$661

Table 4. Water heater costs per year depending on the price of kWh.

The main hot water use is the dishwasher, which is currently run once a day. It is a KitchenAid model KUDG25SHBL0, which is an undercounter dishwasher that saves water with no pre-rinsing. It was purchased in January 1999. There are three settings for the wash cycles: Soak and scrub cycle, normal, or rinse only, Table **** shows the water needed for each setting.

CYCLE	gallons of water used	Water temp. of prewash (degrees F)	Water temp. of main wash (degrees F)
soak and scrub	8.6	130	140
normal	6.9	120	140
rinse only	2.2	n/a	n/a

Table 5. Kellogg House dishwasher. KitchenAid undercounter model KUDG25SHBL0.

Since the dishwasher is run once a day, usually on the normal cycle, then a rough total of 1,277 gallons, or 179.7 cubic feet, are used annually to wash the dishes. The dishwasher and hot water from the sinks are the only requirements of hot water, since there are no showers or laundry facilities in the building. Efficient faucet heads should be put into all the bathrooms and the kitchen sink. Aerator faucet heads mix water and air to make the flow seem bigger than it is. These fixtures will cost $4-$10 and be paid back in a month with water savings. The water heater thermostat should be turned down to 120 degrees, because for each 10 degree decrease, savings of $26-$57 per year will result. The hot water heater can be covered in an insulating wrap to decrease the loss of heat through the container. Over-insulating is better than under-insulating, so the pipes and tank should be covered to optimize and retain the heat in the water.

For Kellogg, a water heater timer can save lots of energy. This devise turns the water heater off during times of inactivity and can be programmed to heat the water for a certain time of day. The dishwasher could be run when the demand for electricity is low, and further reduce the demand on electricity throughout the day. The initial $60-$80 investment for a timer will be paid back in under a year.[39] The energy used to heat this water comes from the electricity but could be obtained from the sun through a solar thermal water heater.

Solar water heaters are a large initial investment but can be worthwhile, especially if the current water heater uses electricity, which is a very inefficient way to heat water. Solar systems that fit a household of 2 to 5 people range from $2,000 to $5,000. Batch

[39] p. 144 Heede

water heaters can be easily made and consist of a water tank in an enclosed, glazed, insulated box, which is exposed to the sun. The sun hits the box and heats the water in the tank, which then flows to the traditional hot water heater. The flat plate collector is the most common type, Figure 15 shows a collector on the house of Jeem Patterson at Cobb Hill Co-housing in Hartland, Vermont. This particular collector is powered by a small photovoltaic solar panel (for more information on solar panels to generate electricity see the Renewable Energy Sources/Solar section). When there's enough sun to power the PV panel, there's enough sun to heat the fluid circulating through the tubes in the insulated box and can be used in the house.

Figure 16. Flat Plate hot water collector, powered by a small Photovoltaic panel (right).

Most of these solar water heating systems use a conventional water heater for storage and backup. Since the weather in New England is variable, some days the sun can heat 100% of the hot water, others the conventional hot water tank will be needed. At Cobb Hill co-housing in Hartland, Vermont, the members of the community recently installed flat plate collectors on their roofs with projections that it will reduce their wood heating demand by 6-7%.

Heat recovery is an efficient way to retain heated water that would otherwise escape down the drain. The Gravity Film heat eXchanger (GFX) technology was developed by a US Department of Energy grant, and could save an average of 34% of electric heating bills. 60% of the heat from drainwater, which flows through the central pipe, can be transferred to cold water, circulating in the coiled pipe.

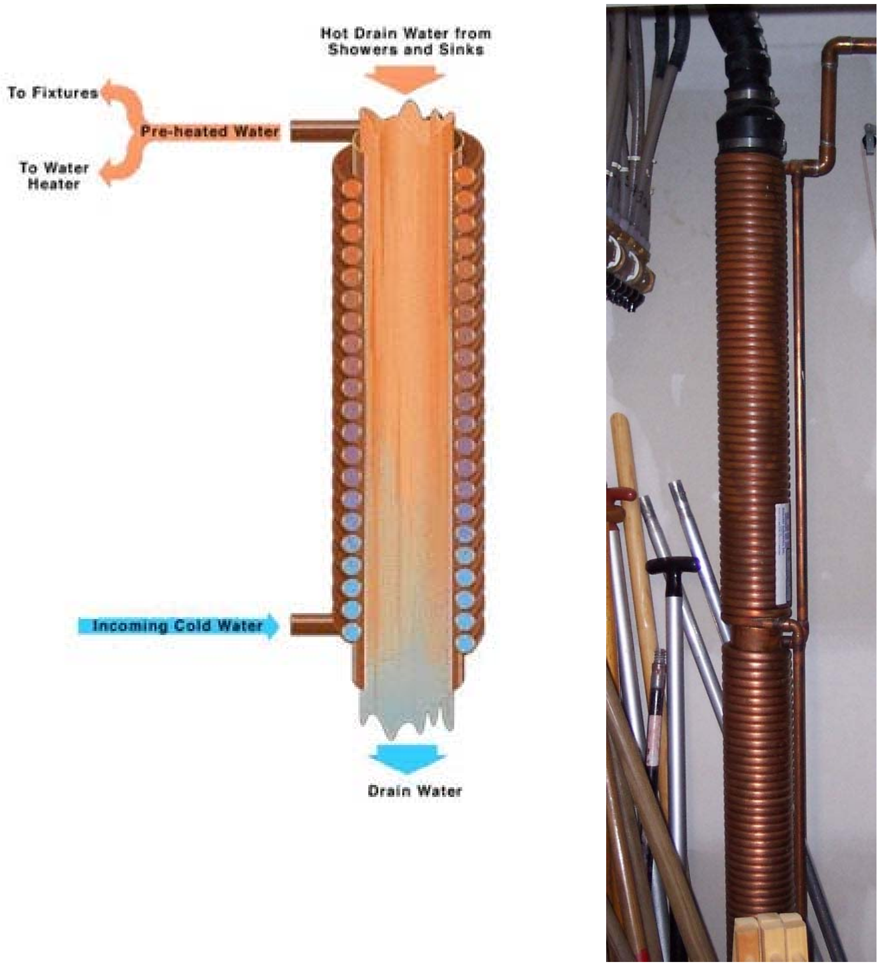


Figure 17. Gravity Film heat Exchanger, recovers heat from drainwater, and helps heat fresh water. Source: http://gfxtechnology.com/ and Cobb Hill co-housing.

Renewable Energy Sources

Wind

Some other feasible renewable sources of energy production are wind power produced on college property on Berlin Mountain, or using ethanol or other plant product for powering the cogeneration plant. Currently Nicholas A. Hiza '03 and others have been developing the option to power Williams College by wind power. There are monitoring devices on top of Berlin Mountain, in Petersburg, NY that are collecting data to determine the feasibility of capturing energy from the wind in that location. The proposed wind turbines are 65 meters (213 feet) tall with 35 meter (115 feet) blades. Each turbine would produce roughly 1.5 megawatts (MW), so the yearly production of a 7 to 9 turbine site would be 10.5 to 13.5 MW of power, or 5.5 million kWh per year. This would produce enough power for 140% of Williams College's needs, and therefore would also be benefiting the community with green energy. The reduction of carbon emissions would be 23,000 tons which is equivalent to taking 6,000 cars off the road.[40] With the current data collection in place, the feasibility of this project is well underway

[40] Berlin Wind Project. http://www.berlinwind.org/

and with continued community awareness will hopefully become a reality. Even if this project does not get implemented, buying green energy certificates from Fenner Windpower in New York should continue.

Biomass/Biodiesel

Biomass or biodiesel burning is also a way to create electricity with neutral carbon emissions. The carbon consumed by the growth of the trees or corn are then released in the combustion of the biomass, but does not contribute to the increase of carbon in the atmosphere like burning fossil fuels.

Solar

The feasibility of solar power in Williamstown, Massachusetts, is shown through photovoltaic panels at the Williamstown Elementary school and the Schow Science Center at Williams College. A 1 kW system can produce 1,200 kWh annually, and during peak producing summer months will reduce the demand on power from utilities that are often over worked in the summer. According to BPVS, in Massachusetts every kWh of energy produced by PV systems replaces about 1.386 lbs of Carbon Dioxide, 3.03 grams of Sulfur Dioxide, 0.91 grams of Nitrogen Oxides, and 2.45 mg of Mercury that would be produced using fossil fuel energy production.[41]

Figure 18. Schow Science Center Photovoltaic panels, installed December, 2004. Williams College Power plant smoke stack is visible in the background.

The Williamstown Elementary School has 24 kilowatt photovoltaic panels with a tilt of 40 degrees installed on its roof in the Fall of 2003. It has been estimated to generate 30,000 kilowatt hours of electricity each year, which is 5-10% of the schools consumption, but would be all of Kellogg's consumption. Data collection from the past year showed an annual energy production of 26,438 kWh.[42]

---

[41] FAQs Berkshire Photovoltaic Systems web page: http://www.bpvs.com

[42] Williamstown Elementary School Solar Panel Charts: http://www.williamstownelementary.org/ link-Solar Panel Charts

Figure 19. View of the 24 kWh Photovoltaic System on the Williamstown Elementary School. Source: http://www.williamstownelementary.org/

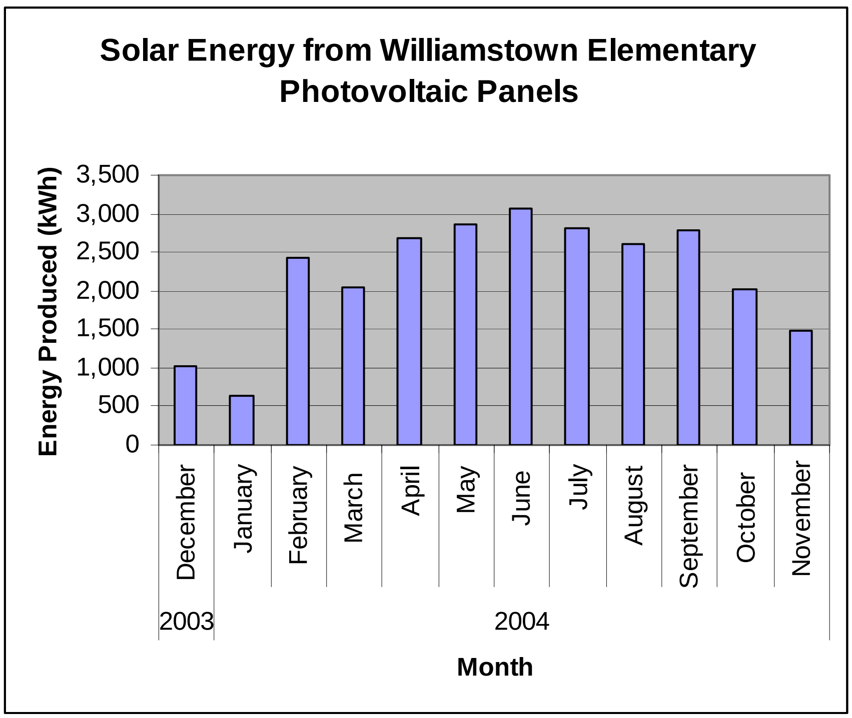


Figure 20. Solar energy production from the Williamstown Elementary School photovoltaic panels. Source: Williamstown Elementary School Photovoltaic Panels, data collected by RWE Schott Solar application. Visit www.williamstownelementary.org (solar panel charts).

Berkshire Photovoltaic Systems (BPVS) installed the panels in both locations in Williamstown. Chris Derby Kilfoyle runs the Adams, MA based company and has installed over one hundred and twenty photovoltaic systems in New England and New York. They use solar modules that are manufactured in Massachusetts, therefore adding to the local economy and reducing transportation needs. The two manufacturers are RWE Schott Solar Incorporated of Billerica and Evergreen Solar of Marlboro.

RWE Schoot Solar is North America's leading manufacturer and distributor of solar panel components and systems. Both Schott and Evergreen manufacture the solar panels with some of the most resource efficient methods, they use less silicon in their manufacturing than some companies waste in the production process. [43] Schott provides a data collection system called SunTrack™ that will simultaneously show the benefits of the solar panels through the computer. Currently Williams College is determining how to get the educational value out of the photovoltaic panels recently installed on the Schow Science Center.

There are many tax incentives to develop renewable energy sources. The Database of State Incentives for Renewable Energy (DSIRE) has information on state, local, and federal incentives that promote renewable energy. Currently, Massachusetts has many corporate and residential tax credits, and also has grants available for schools. The Commercial, Industrial, and Institutional Initiative Grant provides funding for renewable energy production, everything from photovoltaics, to landfill gas, to hydroelectric, and biodiesel. Grants can cover from $1.50/W to $7.75/W depending on the technology used and the grants available.[44] The Center for Ecological Technology (CET) based in Pittsfield, Massachusetts helped to organize funding for the solar panels on Schow Science Center through grants from the Massachusetts Technology Collaborative[45] and the U.S. Department of Energy. Up to date grants must be looked at during construction time to determine the feasibility of installing photovoltaic panels on Kellogg.

The site for photovoltaic panels is extremely important. Southward facing roofs are optimal places to position PV panels because the panels can be mounted onto the roof and not need free standing pole mounts. For 1 kW of PV about 117 square feet of roof is needed for installation.[46] The south facing roof of Kellogg house is limited to part of the Matt Cole Library and the addition that I have designed. There is approximately 1,150 square feet of usable roof on Kellogg house to install PV panels or solar thermal arrays. The optimal pitch for year round production is roughly equal to the latitude, so Williamstown would be 42 degrees, but this can be altered without a large decrease of the energy collected. According to Chris Durby Kilfoyle, the inclination of the panels between 6 and 42 degrees only changes the annual production by 5%. The PV panels recently mounted to the Schow Science center are tilted at 6 degrees because this made the most sense for the flat roof. Future comparisons of the Elementary school and the Schow Science Center's energy production will show the difference of energy collected due to the varying inclination of the panels, but at the same latitude.

The largest factor inhibiting usage of PV panels on Kellogg house is the new library building behind Stetson Hall. This library has potential to shade Kellogg during the winter months when the sun does not get above 24 degrees from the horizon, Table 2 and Appendix F. Along with the shade from the library, any trees, chimneys or other devices whose shadow falls on the roof of Kellogg will affect the efficiency of PV panels.

---

[43] Berkshire Photovoltaic Systems web page. www.bpvs.com FAQs
[44] Please visit www.dsireusa.org for up to date grants and tax incentives.
[45] Massachusetts Technology Collaborative, 75 North Drive, Westborough, MA 01581, Phone: (508) 870-0312, Fax: (508) 898-2275, Website: www.masstech.org
[46] Interview of Lagan Todd. Berkshire Photovoltaic Systems, Technological Assistant.

Although PV panels would be a great educational value to the Center for Environmental Studies, they do not seem feasible in this site because of the new Library's shadow.

The monitoring and knowledge of energy consumption within the building will help occupants plan and utilize resources to the best potential. A visible monitor in the building, with up to the minute energy use, will bring the issue of energy to the minds of the occupants. And if there were PV panels the monitor can show how much of the electricity used in the building is being produced on site. This is another way to educate and teach in a productive and influential manner. By understanding where the electricity and heat are coming from, people will become more aware of consequences of their actions. Along with showing the energy use, there can be a system in place that shows the energy savings within the building compared to another equivalent building that is not as well insulated, or does not have passive solar heat gain.

7. WATER

One of the most major natural resources is water. It cycles through our atmosphere, underground, and along the contours of our land. 97% of the water on earth is salt water and only 3% is fresh water, which is mostly locked in glaciers and polar ice caps. We depend on the fresh water contained within the water cycle driven by the sun.[47] Although New England, and specifically Williamstown, has an ample amount of fresh water in the form of precipitation, there are many aspects of our daily lives that use excessive amounts of our fresh water resource. A change in how water is conserved, collected, stored, treated, and reused is necessary even in areas that have abundant water, in order to ensure a healthy cycle that can be sustained into the future.

The following chart shows the average precipitation in Williamstown broken down for each month of the year. Possible capturing of this precipitation can replace the need for irrigation of the grounds during the summer months. If all of the water was collected from the 4,850 square foot roof of Kellogg then the water runoff from the impervious roof will equal 17,500 cubic feet.

Month	Ave. Ppt, (inches)	St. Dev., (inches)
Jan	3.36	1.62
Feb	3.08	1.37
Mar	3.53	1.66
Apr	3.65	1.57
May	3.73	1.95
Jun	3.87	1.76
Jul	3.98	1.78
Aug	3.75	1.82
Sep	3.76	1.87
Oct	3.27	1.81
Nov	3.88	1.96
Dec	3.47	1.72
TOTAL	**43.33**	

Table 6. Water Precipitation in Williamstown MA, values from the 20th century, Source: David Dethier.

Potable Water

The water that travels through the Williamstown water mains comes from three ground wells that tap a confined ground aquifer. Due to the unique geologic features of the thick layer of clay above the aquifer, the water is under pressure and flows up through the wells without the use of a pump. Two wells are located down on Cole Field, and the third is located near the crossing of Route 2 and the Green River. Pumps at these wells are necessary to transport the water to the 2.75 million gallon storage tank that is located south of the Clark Art Institute, and to a backup open reservoir on Luce Road.[48] Water pumped from one place to the next, contains high embodied energy, so it is best to reduce the amount of water that undergoes this transport process in terms of overall energy savings.

---

[47] P. 79 Guiding Principles of Sustainable Design.

[48] Edward Rondeau, the Williamstown Water and Sewer Superintendent, was uncertain that energy figures per gallon of water could be constructed because of the many externalities that result within the numbers.

Kellogg house used 3,500 cubic feet of water from May 19, 2003 to May 21, 2004, see Table 7. The cost of potable water comes from three types of water charges. A water charge of $2.51 per 100 cubic feet, a sewage charge that is a percentage of the amount of water used by the building, and a Hoosic water quality charge of $2.19 per 100 cubic feet.

Start Date	End Date	Days	Amount of water (cubic feet)	Total Cost
5/19/2003	8/19/2003	92	700	$62.41
8/19/2003	11/19/2003	92	1,000	$82.20
11/19/2003	2/18/2004	91	800	$69.42
2/18/2004	5/21/2004	93	1,000	$82.20
	TOTAL	**368**	**3,500**	**$296.23**

Table 7. Water summary of Kellogg House, Williams College, Williamstown, MA. Source: Don Clark at Buildings and Grounds, Williams College.

Reuse

The Forest Garden needs watering for a couple of hours every other day in the summer, depending on the year.[49] This can be attained by capturing the run-off water from the impervious roof. A simple rain barrel connected to the roof gutter system will accomplish this. The barrel can be put in place during the spring and stored during the winter, so it will not have to withstand freezing and thawing water. The total average rainfall for June, July, and August are 11.6 inches (0.9667 ft). The roof area, 4,850 ft^2 multiplied by the summer rainfall of 0.9667 ft equals 4,690 cubic feet of water. The 4,690 cubic feet of water captured during the average summer rainfalls will be more than sufficient for this need. In fact, a rain barrel could be filled by the water running off the old Kellogg house with a roof area of 1,450 square feet * 0.9667 ft of rainwater =1,400 cubic feet.

The basement of Kellogg House is currently used for storage and infrastructure systems such as the hot water tank, electrical lines, and computer hook ups. There is plenty of room for a storm water catchment that could be used in the toilets throughout the building. Using rain water or gray water, not potable water, to flush the toilets makes sense because rain water and gray water just goes into our sewer system. By not using potable water that has been treated, filtered, and pumped to Kellogg, and using an on site resource, Kellogg can minimize its impact on the water cycle.

The reclamation of gray water within the building is an important concept for creating a sustainable system. Gray water is water that has gone down the sink drain, so it contains nutrients, and some cleaning products but no human waste. Before gray water can be used for irrigation it must pass through a commercial filter or a site-built sand filter.[50] Re-piping Kellogg house seems uneconomical and the new addition will not need any plumbing so these measures should be included in the building for educational purposes if there is funding and support.

[49] Information obtained from Jonathan Landsman, head of the student run Forest Garden.
[50] P. 81 Guiding Principles of Sustainable Design.

Wastewater

Because of Kellogg's small water consumption, 3,500 cubic feet annually, it seems difficult to justify putting in its own wastewater system. But in terms of an educational tool, a wastewater treatment system that uses bacteria and plants to purify the water, such as a Living Machine™, would be a great resource for the building. Bringing the underlying infrastructure of water treatment to the surface will make people aware of the possibilities of using natural systems to cleanse wastewater. The resulting plants that are grown and harvested during the process of wastewater treatment will educate and inform in a productive way. By giving a concrete example of a technology that allows for the same standard of living, and does so in an innovative way without negative environmental impacts.

Living Machines™ take sewage and gray water through a series of tanks with bacteria and other microorganisms that feed off the sewage, in turn, they filter out the harmful pathogens and excess nutrients. Professor John Todd, a biologist at the University of Vermont, was the inventor of the Living Machine™. He designs biological systems that can be applied to engineered facilities, such as waste water treatment. By creating ecosystems within the tanks that contain varying minerals, anaerobic and aerobic environments, adequate colonies of bacteria, and species diversity, a flexible and "natural" ecosystem functions at successfully cleaning the wastewater of excess particulates, bacteria, and nutrients.[51] The living machine is powered by gravity to filter the water through the tanks, and sunlight that fuels the plants, which take up the excess nutrients in the sewage water.

Figure 21. Lush vegetated filled tanks, a part of the Living Machine at the Darrow School.[52]

Small scale systems can be implemented, such as the one at the Darrow School, in New Lebanon, New York, and home owners can even take a course on building Living Machines at the Yestermorrow Design/Build School in Warren, Vermont.[53] The Darrow School has become prominent in the sustainability field because of their use of the Living Machine to treat their wastewater before sending it back into the Hudson River watershed. It was even a stop on the "2003 Green Building Open House Tour" sponsored by the Northeast Sustainable Energy Association. By integrating a wastewater treatment into Kellogg, it will become an icon, with the lush green plants growing from the tanks, of how sustainability can be reached on varying levels. The feasibility of treating the water

---

[51] Todd, John, and Beth Josephson. The Design of Living Technologies for Waste Treatment. Ecological Engineering 6 (1996) 109-136.

[52] *Source*
http://www.darrowschool.com/pages/sitepage.cfm?id=21&pname=Learning%20at%20Darrow&purl=learning_at.cfm

[53] Visit www.yestermorrow.org for more information on the course: Ecological Design and Living Systems.

from the toilets of such a small house is unlikely. The Darrow school has trouble maintaining the bacteria colonies within their tanks in the summer time when students are not present. A gray water system could be implemented to capture the water from sinks and dishwasher and can filter through a series of plants in the greenhouse.

When dealing with sewage, it's easiest to not create it in the first place. With the relocation of Kellogg composting toilets could easily be put into the existing bathrooms with the collectors situated directly below in the basement. It seems backwards to take clean, potable water, and make it dirty and pathogenic with feces. Composting toilets would reduce the need for water to flush toilets. At Cobb Hill, Phoenix Composting Toilets are used in all of the buildings.

Figure 22. Phoenix Composting toilet at Cobb Hill Co-housing in Hartland, VT.[54]

The composting process in the Phoenix is aerobic, so it uses oxygen, moisture, and bacteria to convert waste into stabilized compost. According to the Phoenix literature pathogens are nearly eliminated and the volume of the organic material is reduced by 90 percent, requiring very little waste removal. With waterless toilets the toilet head must be positioned above the composter, and this causes inflexible design ramifications. In the proposed plan, the bathrooms are situated so that it would be easy to put a composter in the basement directly below both toilet bowls.

---

[54] Visit www.compostingtoilet.com for more information. Advanced Composting Systems, 195 Meadows Rd., Whitefish, MT 59937, (406) 862-3854, phoenix@compostingtoilet.com.

The aerobic-microorganisms used in the Phoenix Composting Toilet rely on oxygen and work 20 times faster than anaerobic organism. With any composting of human waste there are strict regulations as to what can be released back into the environment. The removed composted matter at Cobb Hill currently must be brought to the dump, or buried on the property for 3 years until it can be deemed "safe".[55] Often chlorine is needed as a regulatory precaution to disinfect water that has been treated before it is releasable back into the environment. This is to ensure no virulent organisms are present after the water has been processed. A common alternative to chlorine are ozone and ultraviolet light,[56] but these methods do not seem feasible with Williamstown's unpredictable sun. See Appendix K for more literature on the Phoenix Composting Toilet.

By keeping the feces out of waste water, it is a much simpler process to filter and cleanse the water and use it in another process. The houses at Cobb hill, with efficient water faucets, showerheads, and composting toilets, use only 30% of the water that a traditional house of the same size. If Kellogg can reduce water consumption in the summer by capturing rain water, and can use the gray water to flush toilets or water plants, or install composting toilets, less water will be required. In turn, Kellogg will become more internally sustainable and a learning tool for implementing these processes in larger buildings.

[55] Peterson, Jeem. Personal Interview December 17, 2004. Hartland, Vermont.
[56] p. 92 Guiding Principles of Sustainable Design

8. MATERIALS

The materials chosen for a building project should be looked at for strength, cost, appearance, sustainability, environmental impacts, durability, and toxicity. Green building materials respond to one or more of the factors listed above and can be made from a variety of means such as sustainably harvested trees to salvaged material from a previous use. Although the market for these greener materials is new and often pricier than traditional materials, the economic difference is shrinking. LEED certifications have helped to create a market for the reuse and recycling of building materials, along with encouraging the use of local materials.

"Reduce, reuse, and recycle" are key components when creating a building that uses resources efficiently. Fewer resources will be needed and thus will reduce the cost and the environmental impacts of the building if the building is the size necessary for the functions within it. By reusing building material, or even whole buildings, like the Kellogg House, virgin materials will not need to be processed and transported to the site if the existing materials are used. The fate of Seeley and Fernald houses are ambiguous to date. If they are fated to be demolished instead of being relocated, there are aspects of them that could be used in the Kellogg addition, such as the slate roofs, the wood flooring, or even the framing lumber.

Embodied Energy

The materials used in a building project should take into account the energy required to produce and transport them to the site. All materials contain "embodied energy", the amount of energy needed to produce the material. It is difficult to determine the exact embodied energy within materials, but lumber has low embodied energy because it is produced through photosynthesis, and does not require fossil fuels for production such as steel, plastic, and aluminum. The embodied energy of wood varies due to the treatment processes, but a typical industrial wood drying and impregnation with preservatives takes about 640 kilowatt-hours per ton. The next lowest embodied energy of a material is brick, 4 times that of wood, then concrete 5 times, plastic 6 times, glass 14 times, steel 24 times, and aluminum 126 times more embodied energy than wood.[57]

The reduction of products that use excessive processing and in turn lots of petroleum, such as plywood, plastic countertops, flooring, and piping, should be a focus on any building project. Although these cannot be completely eliminated from any building, an awareness of reducing them can have beneficial consequences.

Local Materials

LEED stresses the use of local materials, thereby supporting local economy and trades people, while not using fossil fuels to transport the materials across the world. There are many natural resources around Williamstown, such as slate, granite, and lumber. Middlebury College has been proactive in implementing local materials into their building projects with great results. The newly completed Middlebury College library uses marble on the exterior of the building quarried in Danby, Vermont and installed by J.B. Stone of Jericho, Vermont.

---

[57]The Architectural League of New York. http://www.archleague.org/tenshadesofgreen/shade4.html

.

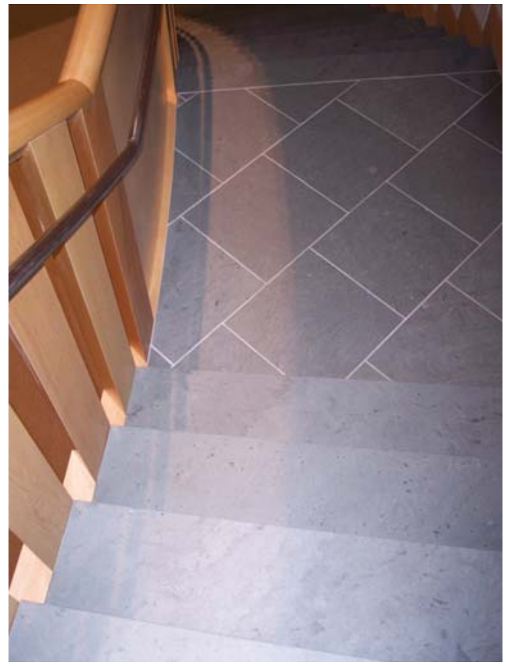
 

Figure 23. Local Marble, left, quarried in Danby, VT, on the exterior and local slate from Poultney, Vermont, used in the atrium and on the stairs of Middlebury College's Library.

The slate in the library is from Poultney, Vermont and installed by Barre Stonecraft. Slate would be ideal for the floor in the new Kellogg addition, because it is durable, dark colored, and will store energy in its mass that will help maintain a constant temperature in the building. In any building project, wood is needed for structural support, flooring, interior detailing, and in the case of CES is needed to maintain the homey feel. This wood does not need to be of the same species can contain imperfections such as knots. Knots create individuality of each piece of wood and will make the addition even more unique and homey. There have been studies and suggestions to selectively harvest wood from sections of the Vermont portion of Williams' Hopkins Memorial Forest. This should be further investigated and developed into this building project because it is important to know where and under what context materials and lumber are being harvested. In turn, the land harvested in HMF can be used for scientific research to monitor the consequences of selective harvesting. Determining ways to harvest wood in a sustainable fashion on the college's own land will be an important educational, and possibly economic, tool.

Figure 24. Local wood, extracted from the Middlebury College's Breadloaf Mountain Campus, the furniture was manufactured by Vermont companies Island Pond Woodworkers, Beeken-Parsons, and Neudorfer Incorporated.

The renovation and redesign of Kellogg House has some interesting possibilities in terms of reusing materials that are currently on site. Certainly Sawyer library and the Stetson Faculty offices will be demolished during the Stetson/Sawyer project, and possibly Seeley and Fernald houses as well. Immense amounts of "waste" material will result and can possibly be used elsewhere on site. The bedrock removed from the Stetson or the North Faculty Building site, should be used in retaining walls and foundations. The seven foot grade change of Kellogg to the MCML makes it necessary to build a retaining wall, and by using materials already found on the site it will be cheaper and require less energy for transportation. Local materials in buildings enable the occupants to become more connected to their particular site. This does not mean the building must *look* like the surrounding site; it merely alludes to the fact that by using local materials people begin to incorporate those materials into the foundation of the place they live. Similarly to how old farm houses are integral to the New England landscape and seem out of place when put in the southwest desert. Every area has natural resources and when these are used a visual connection is created between the building and the natural features seen around the area.

Building Shell

The Kellogg house should be tightened up at the windows and with more insulation. More insulation will lessen the heating loads in the winter and summer cooling loads. The building, when designed with the sun and seasons in mind will create spaces that benefit from the direct sun, or shield it. Caulking and sealing gaps will reduce the airflow in and out of the building, and create a more homogenous temperature with less energy required.

Windows

"*I hummed the song and wiped the condensation from my giant picture window. . .so I could finally view the water. On the other side of the hermetically sealed glass, a gentle breeze swayed the palm trees, but I could not feel it. My picture window was bonded to the cinderblock walls. There were no sliding glass doors or small vent windows and seeing my breath frost up in the overly air-conditioned room with no thermostat, I knew that I was being protected from hurling myself to my death. . .(in a) three-foot plunge to the soft sand beach."* –Jimmy Buffett, Singer 1989.[58]

Windows are what protect us, yet let us see outside. They are a way to ground the occupants of a building with the seasons, weather, and occurrences outside. At Williams, students must be inside for considerable amounts of time, so being indirectly connected to the outside, with views into the landscape, is important for our health and sanity. Air spaces between layers of glass and glazing will help windows insulate better. One of the best improvements for window insulation was low-emissivity (low-e) coating that was developed in the 1980s. Transparent coatings of silver or tin oxide permit the short waves of visible light to pass through the window, while reflecting back the long waves of infrared heat radiation into the building. There are variations of low-e windows for northern and southern climates, and it can even be appropriate to have different windows on the north side versus the south side of a building. The northern windows should have the lowest U-value possible, while the southern windows should take advantage of passive solar heat gain and have northern low-e windows.

Kellogg's old windows are extremely drafty and are only single paned, with no storm windows. This is a huge area of heat loss for the building and should be retrofitted with new windows that have much higher insulating components. There are many ways to insulate windows including fitting storm windows to create dead air space that helps insulate. Storm windows can cost $7.50-$12.50 per square foot, but can reduce heat loss by 25-50%.[59]

Insulation

The building envelope needs to be tight, will little air flow from the outside, but it also needs to be insulated to slow the transfer of heat out of the building in the winter and into the building in the summer. Windows are the area of a house that has the lowest insulation, but by caulking around windows and plugging up holes on an average a 3 x 4 ft window, $20 worth of energy per heating season can be saved.

The rest of the building structure needs to be well insulated to ensure comfort of the occupants. The most common insulation is fiberglass blown or sheets. These can be produced from recycled glass, but often result in poor air quality because of flecs of glass being emitted from the insulation. Other less harmful insulations are cotton, cellulose, or

---

[58] p. 46 Barnett
[59] P 118. Heede

mineral wool. Mineral wool insulation was used in the Middlebury College Library, they used Roxul, which is made from natural basalt rock and recycled metal.[60]

One cellulose company Nu-Wool Company, Inc. based in Jenison, Michigan uses recycled paper to produce insulation. A local cellulose manufacturer, Bill Hulstrunk of National Fiber, is located in Belchertown, Massachusetts.[61] By blowing more insulation into the old frame of Kellogg, the comfort within will maintain a more constant temperature and be beneficial for the occupants. There is inadequate space in the existing walls because of the plank construction, so considerations should be made to add a new wall with more insulation behind it.

The attic is the space most easily insulated because the current roof does not have any insulation between the planks and shingles. The attic should be remodeled into a very usable space for offices. By finishing the attic and covering the floors of the crawl spaces, there will be ample room for storage in the crawl spaces, and two faculty offices will be made out of the previously existing and underutilized space in Kellogg's attic.

Interior Products

When determining paints, carpets, and other finishes to be put in the addition, it is extremely important to use products with low volatile organic compounds (VOCs). These are often referred to as the "new building smell", which are particulates that emit from carpets, plywood, and other processed materials. It's important to use paints and adhesives that have low VOC. Sherwin-Williams has a low odor interior latex paint called Harmony, that has anti-microbial aspects and good for areas with high moisture content and potential to mold.[62] Wood finishes should be water based, polycrylic stains, but stains used outside may need an oil base to be strong enough to hold up against the elements and repel water. Bioshield makes an oil finish called Hard Oil #9[63] that was used in the Cobb Hill Co-housing community in Hartland, Vermont. It is an expensive product, but is durable and applicable to our variable northeast climate.

The carpet used in the building should be made from recycled content and able to be returned to the manufacture after its life time to be remade into carpet. Carpet-Interface Incorporated partakes in this closed loop manufacturing process and consequently reduces their need to purchase virgin materials to make new carpet. This saves money, energy, and resources, and is a system that more manufacturing companies should look into.

Exterior Products

The nature of New England winters creates thawing and freezing that creates dangerous ice on walkways and roads. In order to reduce this ice build up salt is normally thrown on walkways around Kellogg. Building and Grounds has recently turned to Ice Ban® as a precursor to salt on the walkways. Ice Ban was developed by the Highway Innovative Technology Evaluation Center (HITEC), and is made from corn

[60] Middlebury College green building information. http://web.middlebury.edu/NR/rdonlyres/3EC4CF4F-5BB3-4EA2-9B9E-362A0EDB5E29/0/sust_features.pdf
[61] Bill Hulstrnk, National Fiber, 1039 Ferno Road Williamstown, VT 05679, Phone: (802) 485-5735, email: whulstrunk@tds.net
[62] Peterson, Jeem. Interview at Cobb Hill Co-Housing, Hartland, Vermont. December 17, 2004, and www2.shirwin-williams.com
[63] Visit www.bioshieldpaint.com for more information.

processing residues and can then be mixed with liquid salts for anti-icing and deicing. The HITEC findings confirm that Ice Ban can be effective in snow and ice control by melting snow and ice at lower temperatures and faster than traditional methods. To date there are little or no adverse effects on roads, infrastructure, or vehicles.[64] Williams College sprays Ice Ban on the walkways before a storm is suppose to hit, but then resort to salt after the snow is falling. It is unclear as to the success of this product, but by taking waste from corn processing, the use of Ice Ban can be beneficial in terms of using waste in productive ways.

Fertilizers for the Garden and surrounding lawn areas can be from the compost pile situated just north of Kellogg. This will maintain the nutrients on the site and reduce wastes from the forest garden and kitchen, and in turn promote the recycling of nutrients.

Reuse

During the large scale construction about to occur around Kellogg, there will be large amounts of demolition and land-clearing debris. Usually this debris is directed to the landfill, but to reduce Kellogg's impact on resources these excess materials can be redirected to other places or resale. The materials used in the new construction can in turn be products up for resale. Materials Exchange is a web based provider that allows advertisements to be posted on materials that are for sale that would otherwise be put into the landfill. Searching this site found some pertinent materials for this projects, such as greenhouses for sale in Hadley, Massachusetts, with a price of $0.10 per square foot of glass. They have double strength glass 24" x 24", 24" x 26", and 34" x 35" sheets. [65]

The Center for Ecological Technology has a Re-store: Home Improvement Center in Springfield, Massachusetts, that obtains valuable materials from building projects and resells them at low prices. This would be an excellent place to bring construction debris if it's not possible to reuse the material at the site.[66]

Internally, Kellogg recycles what the Williams College campus recycles, glass, metal cans, plastic (#1-7), plain/colored paper, manila envelopes, envelopes, shiny paper, batteries, inkjet cartridges, newspaper, magazines, corrugated cardboard. Along with recycling, a sustainable purchasing program needs to be developed in terms of office needs. The paper used in Kellogg, and on the entire campus, is *Geocycle* a 30% post-consumer-waste paper. The printer in Kellogg is also used on a duplex mode to print on both sides of the paper, therefore reducing waste. Ways to use even more recycled content paper and materials should be part of the goal of CES.

It is important to compare the life-cycle, durability, and structural efficiency of all products. If a material with high embodied energy has a long life-span, then the net energy required to produce the initial materials will be reduced in relation to the longevity of the material. Buildings should be constructed with the idea of a gift to the future, a durable and beautiful structure that is also adaptable and functional. When determining what materials to use in this building, or any building project, there is never

---

[64] Earth Friendly Chemicals, Incorpoarted. Exclusive U.S. Manufacturer of Ice Ban®. www.efchem.org
[65] Contact information: Gerald Parlin, of Demolition Tech, Oxford, Maine. email: chimneytech@yahoo.com. or visit www.materialsexchange.org
[66] Visit www.restoreonline.org for more information.

one final answer that will satisfy all parts and be the best in terms of environmental impacts. For example, fluorescent lamps can reduce the overall energy consumption of a building, but they contain toxic mercury and therefore are difficult to dispose of after their lifetime. All of the issues should be considered, such as life-cycle costs, embodied energy, and sustainability, to ensure the best choice for each situation.

9. CONCLUSIONS

Architectural Drawings/Model

See Appendix G and H for elevations and plans of my proposed addition and connection between the relocated Kellogg house and the existing Matt Cole Memorial Library. The future square footage is broken down in Table 8, with added space for new offices, student study spaces, a greenhouse and atrium, and a larger kitchen.

Type of Space		Future Area (ft^2)	Current Area (ft^2)	Change Area (ft^2)
Storage	Basement	1489	1489	0
	Attic-crawl space	300	1200	-900
Faculty/Staff	Office	2440	1794	646
	Office Services	80	0	80
Student	Office	220	220	0
	Study space	220	0	220
	Computer Lab	625	529	96
	Living Room	510	510	0
Public	Library	1729	1729	0
	Bathroom	170	170	0
	Atrium/Greenhouse	560	0	560
	Kitchen	350	170	180
	TOTAL	**8693**	**7811**	**882**

Table 8. Breakdown of the current and future spaces in CES, the square footage of each, and the change in area with the redesign.

Design of the Addition

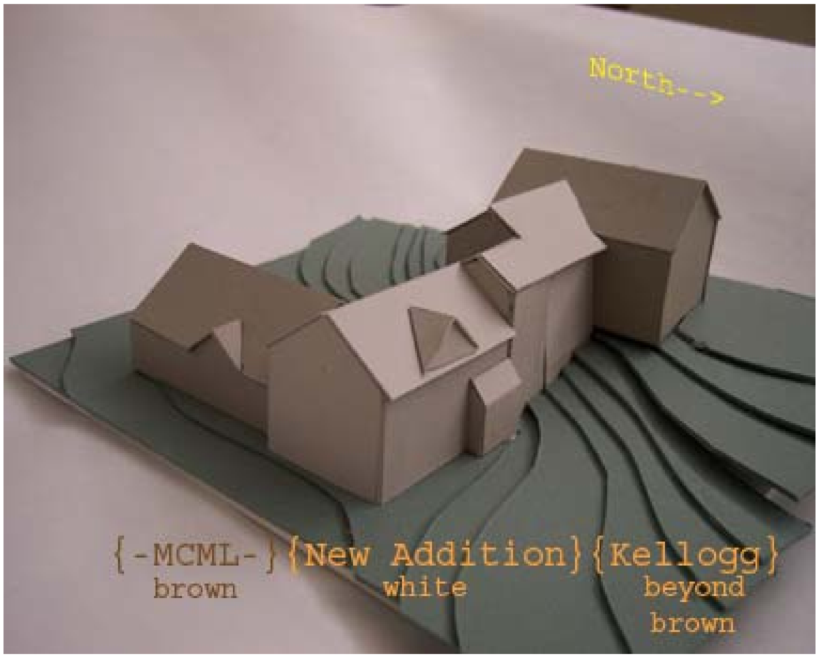


Figure 25. Proposed addition in white, Kellogg house in brown beyond and MCML to the left. (Appendix I)

Choices need to be made that allow the Center for Environmental Studies to function more cohesively and to utilize building practices that embody the mission of the program to move towards a future in a responsible fashion. My architectural drawings integrate the relocated Kellogg house, the existing Matt Cole Memorial Library, and the new additions to create a cohesive and appropriate center for the Environmental Studies Department at Williams College. By being sensitive to the New England farm house with additions that elongate the back "working" area of the house, the new addition allows for integration with architectural design that fits the character of the existing structures and the community.

The accumulation of research has initiated ways of looking at the issue of moving Kellogg house and reattaching it to the MCML in a holistic and comprehensive analysis. In exploring the usage and underlying functions within the building I have been able to propose some aspects of the new design that will benefit the students, faculty, and staff that use Kellogg.

A central entry that facilitates the transition inside will help to create a meeting place for students that does not disturb the quieter areas of the building. This space will be flanked by traditional "mudrooms" that will help to minimize the cold air wafting in from outside. Easy access through this central space, allows for the flow of people through the building to occur smoothly. The "atrium" that is open to a second story balcony will contain an enclosed greenhouse to the south with potential to house a Living Machine wastewater treatment tanks with vegetation. Connection to the existing MCML will be off the atrium space, along with a door to the new computer lab, which is not connected to the library so that it can be open 24 hours a day. Many students currently use the library computers for quickly checking email, so two computers should be stationed in the atrium area to separate this quick transaction from the needs of long term student use in a computer lab.

In the north part of this public space will be the circulation, an elevator and a staircase. Because of the seven feet change of grade the new center will have the feeling of four floors, each connected by a half flight of stairs. The top floor of my addition will have a balcony space for studying and hanging out directly over the public space downstairs. Above the computer lab will be five offices that will take the place of the four south wing offices that should not be saved during the relocation. The additional office will allow for interdepartmental faculty to have a base at CES, retired faculty, or visiting professors. Two more offices will also be located in the renovated attic space of Kellogg. The faculty offices located on the second and third floors help to separate the public and students spaces from the faculty spaces.

The separation of spaces is needed in order to allow the multiple functions of the building to work well together. The second floor study space will help to create the semi-quiet spaces students desire, while being connected to the first floor atrium and the "center" of the building. By closing off the MCML from the computer lab and the public space, the library once again functions as a quiet place to work and study. A library office will help organize and separate the internal workings of the library from the public space.

Kellogg will maintain the same configuration, except that the first floor bathroom should be brought northward and open off of the hallway, not the kitchen like it is currently, this also makes it more accessible to the "center". The kitchen can then have south facing windows and benefit from a more spacious configuration. The second floor of Kellogg will have a larger storage closet next to the bathroom, which will contain the copy machine, printers, and space for office supplies. The front office will once again function as the secretary/information place for the department because the front door facing west will be used as it was intended and create a better flow through the building.

An integrated approach to this proposal has resulted in a plan that considers the history, site, usage, and functions of the building. Integrating these aspects into the building process will create a functional and beautiful Center for Environmental Studies.

Thanks

This has been a compilation from many disparate sources and I'm grateful for all the help and enthusiasm that I encountered along the way. Special thanks go to Hank Art and Ann McCallum for agreeing to sponsor this thesis.

Additional thanks go to the people who took time to meet with me and share their knowledge, the faculty and staff who reside in the Kellogg house, Jeem Peterson and Deb Jones for welcoming me into their home, Don Clark, Christopher Williams, Oliver Holmes, David Dethier, Chris Derby Kilfoyle, Lagan Todd, Edward Rondeau, Sandy Zepka, John Bryant, Marc Scalauka, Todd Holland, Nancy Apple, Russell Roberts and others at Bohlin Cywinski Jackson Architecture firm, and all the students who filled out my survey and took the time to talk with me, hear me out, and listen to my ideas.

Works Cited

Anderson, Bruce. The Solar Home Book: heating, cooling, and designing with the sun. Cheshire Books. Harrisville, New Hampshire: 1976.

Barnett, Dianna, William Browning. A Primer on Sustainable Building. Rocky Mountain Institute, Green Development Services. Rocky Mountain Institute. Snowmass, Colorado: 1995.

Bohlin Cywinski Jackson Architects. Public presentation, Stetson Faculty Lounge, Williams College, Williamstown, MA. November 16, 2004.

Bryant, John, Marc Scalauka, Todd Holland, and Nancy Apple. Personal interview at Blanchard Student Center room 216, Mt. Holyoke College, South Hadley, Massachusetts. November 17, 2004.

Building and Grounds Department. Williams College. *Kellogg House Expansion*. Section 07210, Building Insulation. June 7, 1994.

Center for Ecological Technology (CET). Pittsfield, MA. www.cetonline.org

Coldham Architects, LLC. "What is Green Architecture?" Web page: www.coldhamarchitects.com

Heed, Richard. *Home*made Money: How to Save Energy and Dollars in Your Home. Rocky Mountain Institute. Snowmass Colorado: 1995.

Intergovernmental Panel on Climate Change. Climate Change 2001: Mitigation. Section 3.2 *Trends in Energy Use and Associated Greenhouse Gas Emissions.* www.ipcc.ch/index.html

Kilfoyle, Chris Derby. Berkshire Photovoltaic Systems *Owner and Manager*. Adams, Massachusetts. www.bpvs.com

Kraushaar, Jack J. Robert A. Ristinen. Energy and Problems of a Technical Society. Second Ed. John Wiley and Sons, Inc. New York. 1993.

LEED: Leadership in Energy and Environmental Design. http://www.usgbc.org/LEED/LEED_main.asp

Middlebury College Green Building Information. Personal site visit, December 4, 2004. http://web.middlebury.edu/NR/rdonlyres/3EC4CF4F-5BB3-4EA2-9B9E-362A0EDB5E29/0/sust_features.pdf

Peterson, Jeem. Cobb Hill Co-housing resident, Hartland, VT. Personal interview December 17,2004.

Rauscher, Marcella. History of the Matt Cole Library. An Environmental Library at the Center for Environmental Studies. January 1993.

Rondeau, Edward. Williamstown Public Works Department. *Williamstown Water and Sewer Superintendent.* Personal interview October 27, 2004.

Rousseau, David, James Wasley. Healthy by Design: Building and Remodeling Solutions for Creating Healthy Homes. Hartley and Marks. Point Roberts, Washington: 1997.

Thayer, Robert. Gray World, Green Heart: technology, nature, and the sustainable landscape. John Wiley and Sons, Incorporated. New York: 1994.

Todd, Lagan, Berkshire Photovoltaic Systems *Technical Assistant*. Personal Interview.

United States Department of the Interior. Guiding Principles of Sustainable Design. National Park Service. Denver, CO: 1993.

U.S. Green Building Council: www.usgbc.org

Van Der Ryn, Sim, Stewart Cowan. Ecological Design. Island Press. Washington D.C.: 1996.

Venturi, Scott Brown and Associates, Incorporated. *Campus Planning: Statement of Missions, Goals, Opportunities, Problems, Issues, and Options (MGOPIO II).* Williams College, Williamstown, Massachusetts. October 4, 2001.

Williams, Christopher. *Building and Grounds Architect.* Williams College, Williamstown, Massachusetts. Personal Interview September 29, 2004.

Williams College Archives: Center for Environmental Studies. Records. #93-058. *Administration and Event Time Line for Center for Environmental Studies.*

Williams College Archives: Center for Environmental Studies. 99 Ad8 New Foundations by Dr. Vanderpoel Adriance (Williams 1890), 0-150 “Stories of Old Williamstown” 1945,

Williams College Archives: A Journal: Center for Environmental Studies vol. 10 1993 p. 34-37. Archives and Special collections Photos Files and Card Files, and Campus Maps.

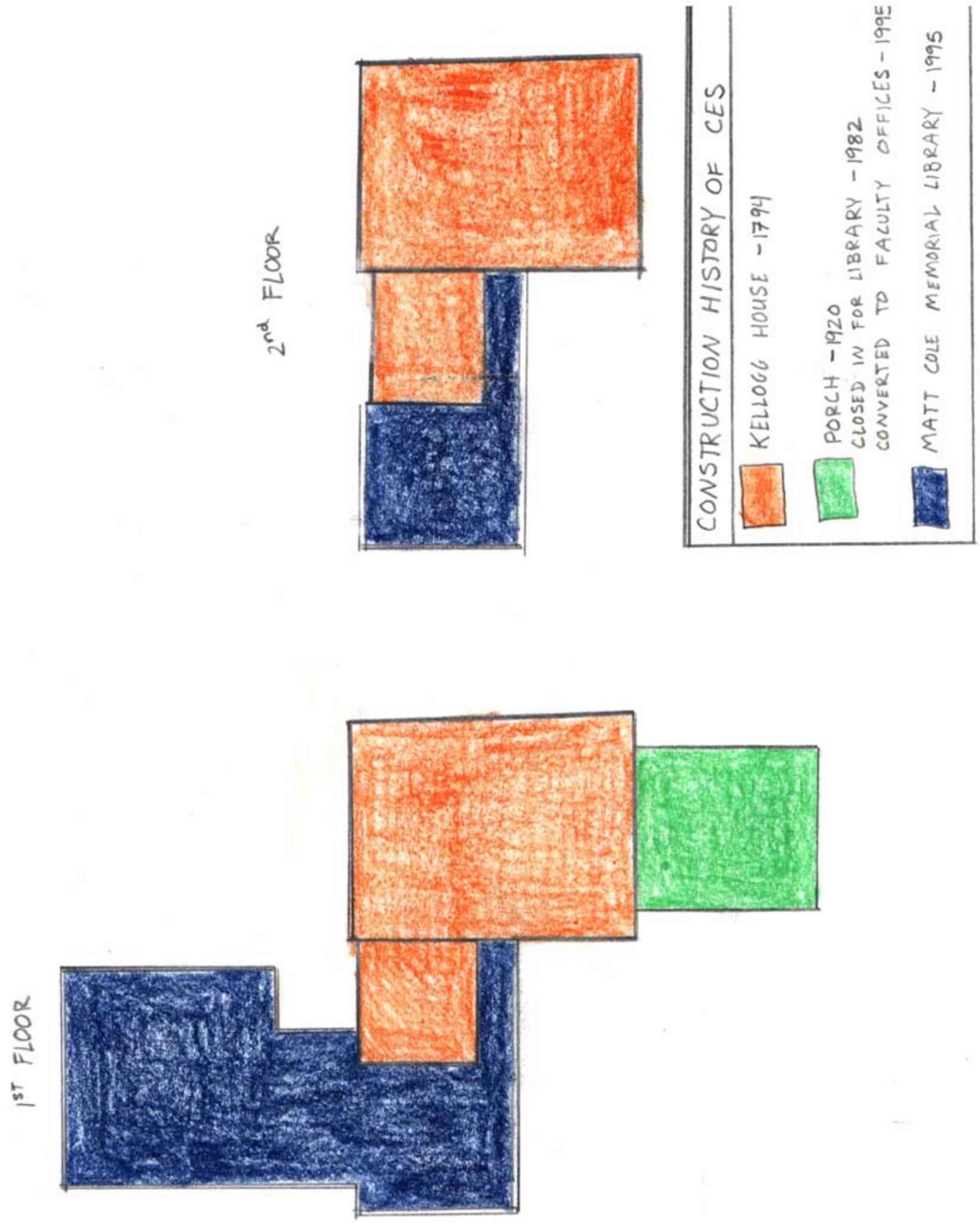
Yeang, Ken. Designing with Nature: The Ecological Basis for Architectural Design. McGraw-Hill, Incorporated. New York: 1995.

Yudelson, Jerry. 365 Questions for Your Next Green Building Project. Interface Engineering: March 2003.

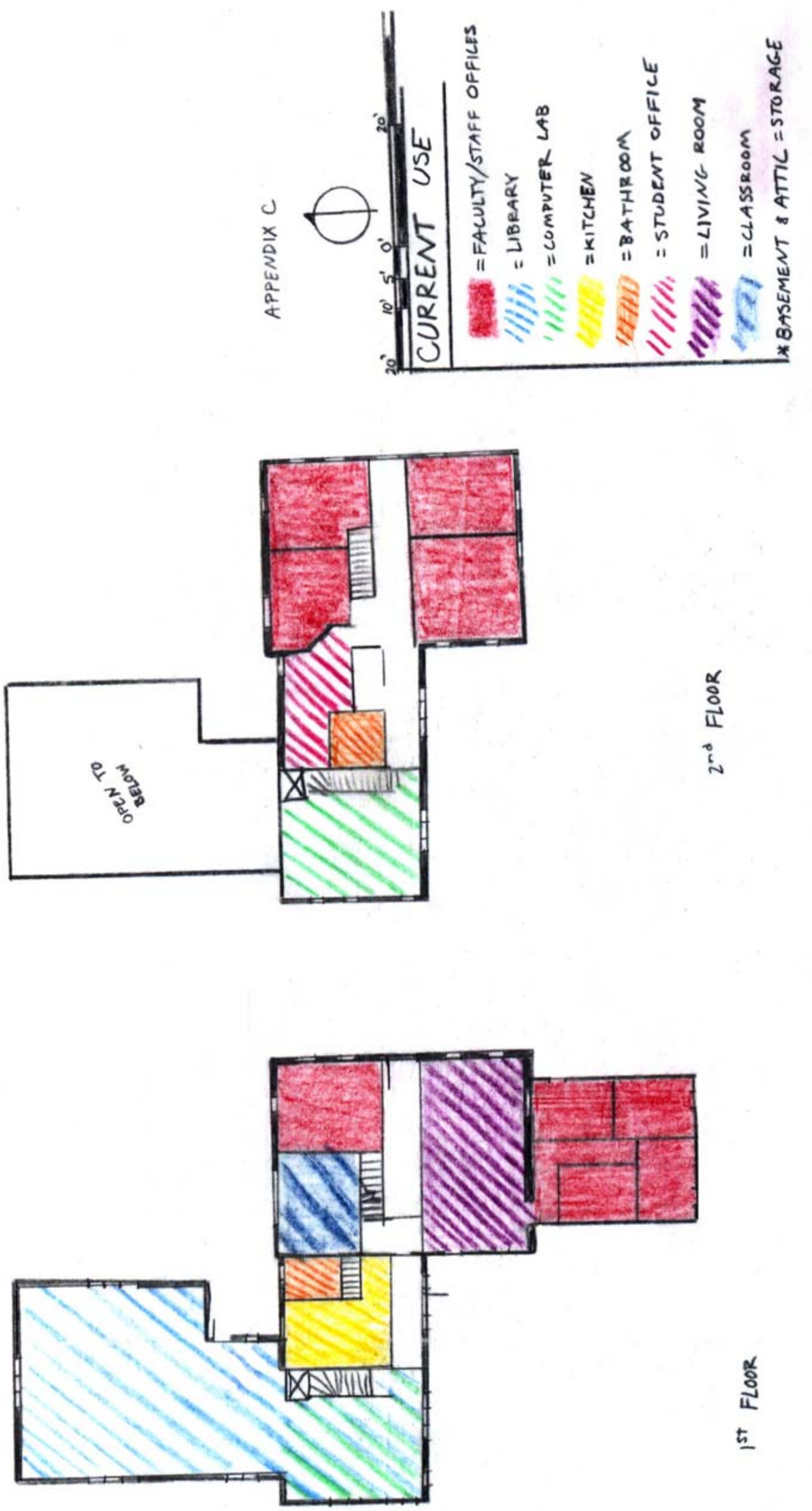
List of Tables and Figures

Appendix A-Current Site Plan

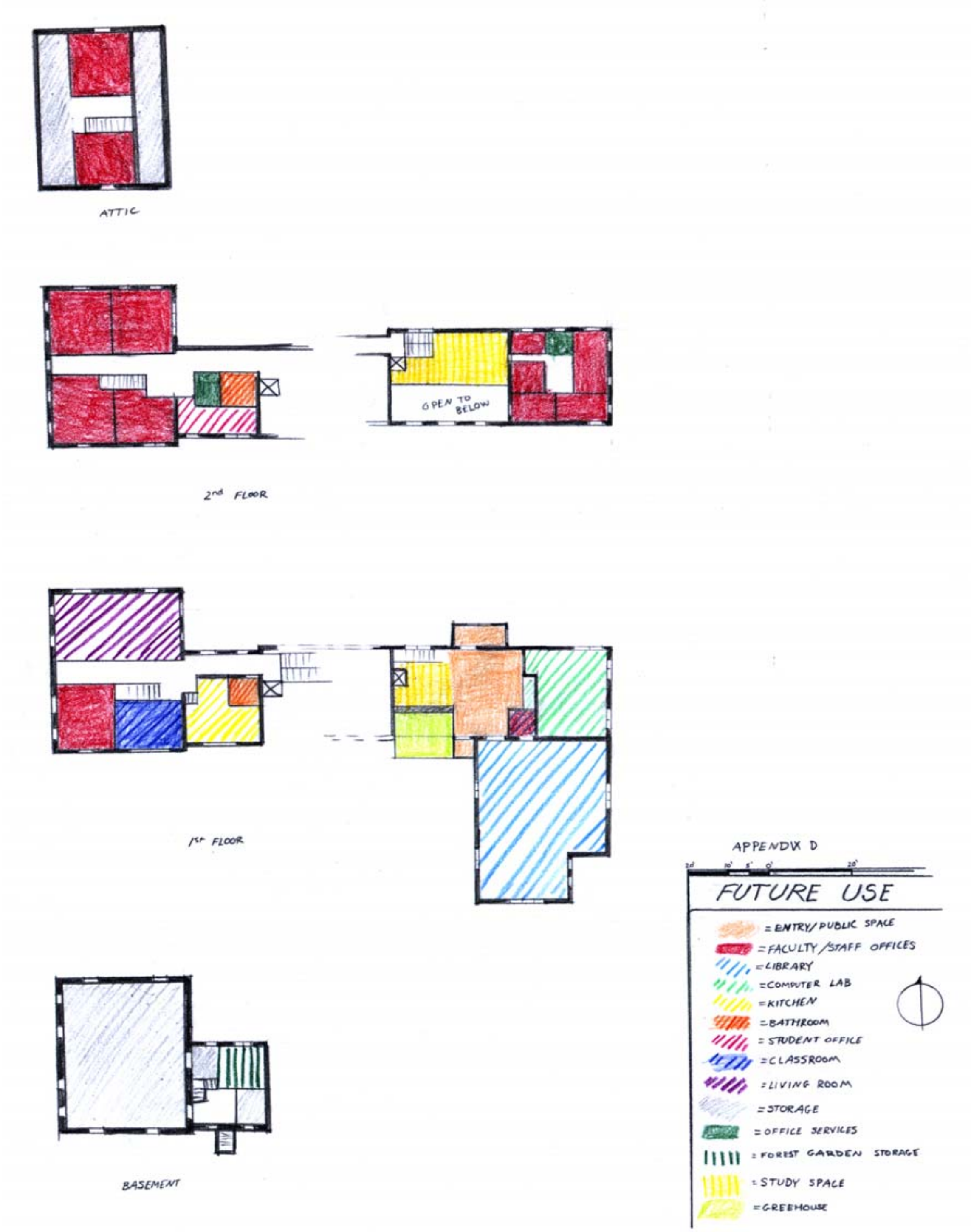
Appendix B-Construction History



Appendix C-Current Use

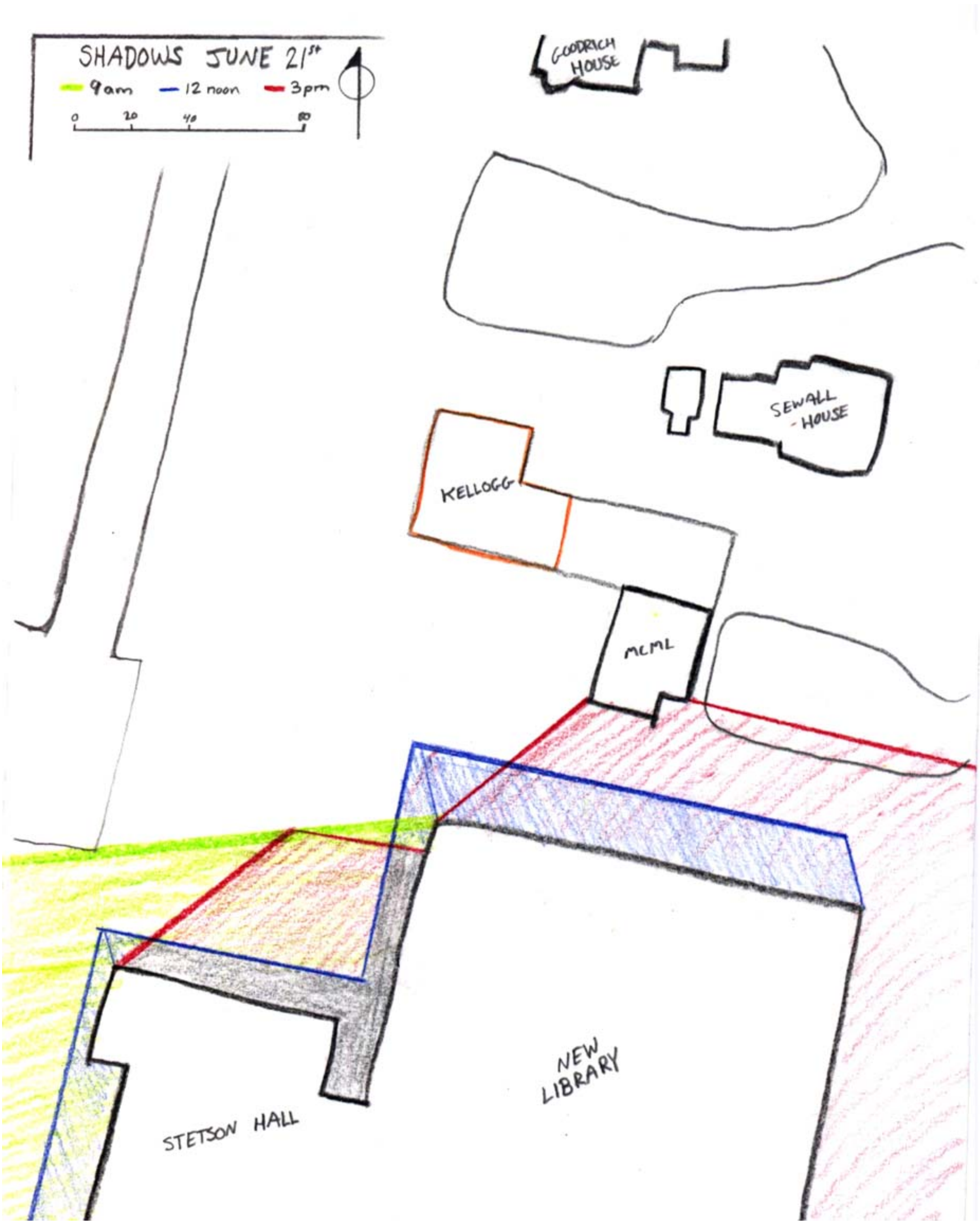


Appendix D-Future Use

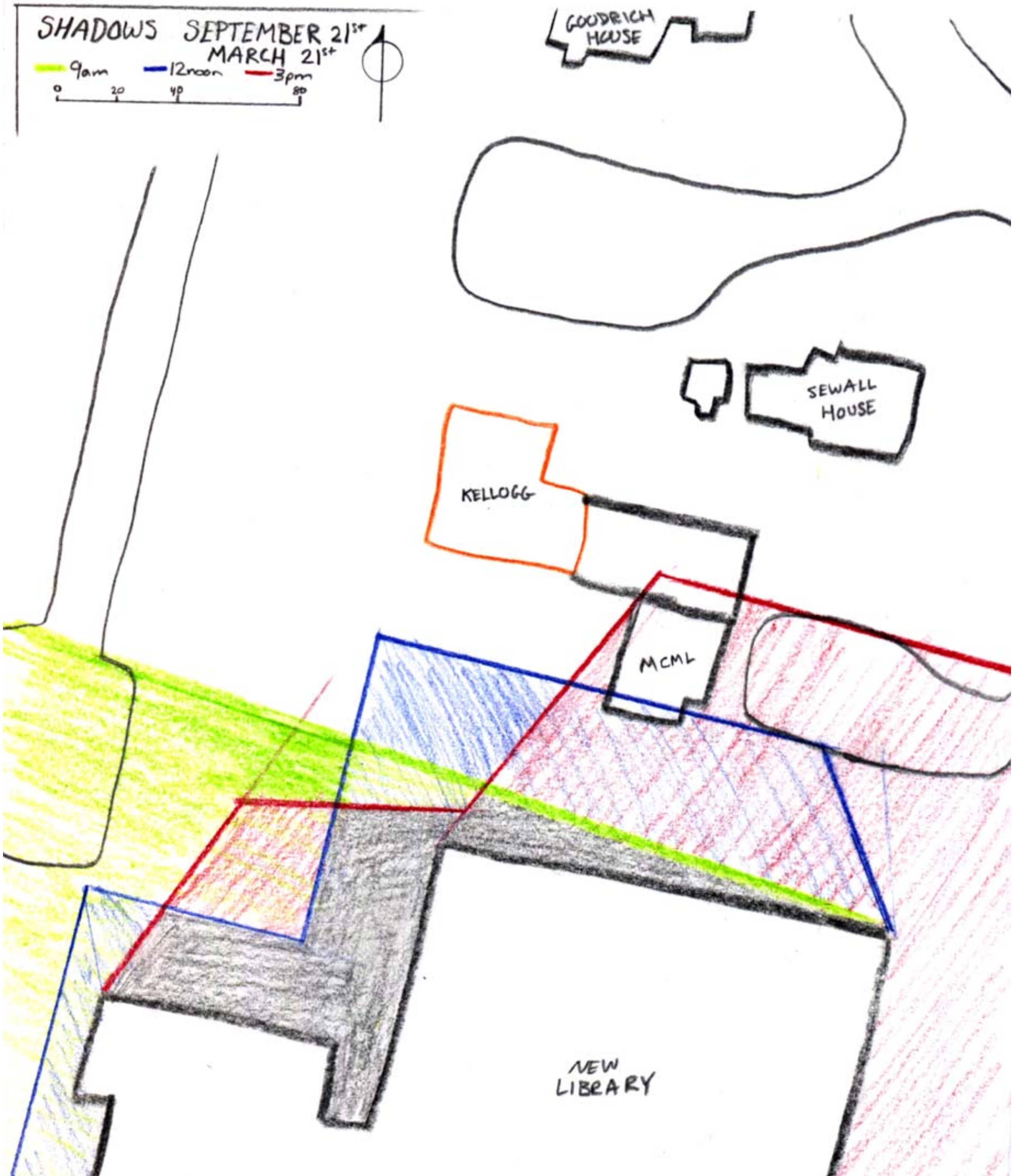


Appendix E-Future Site Plan

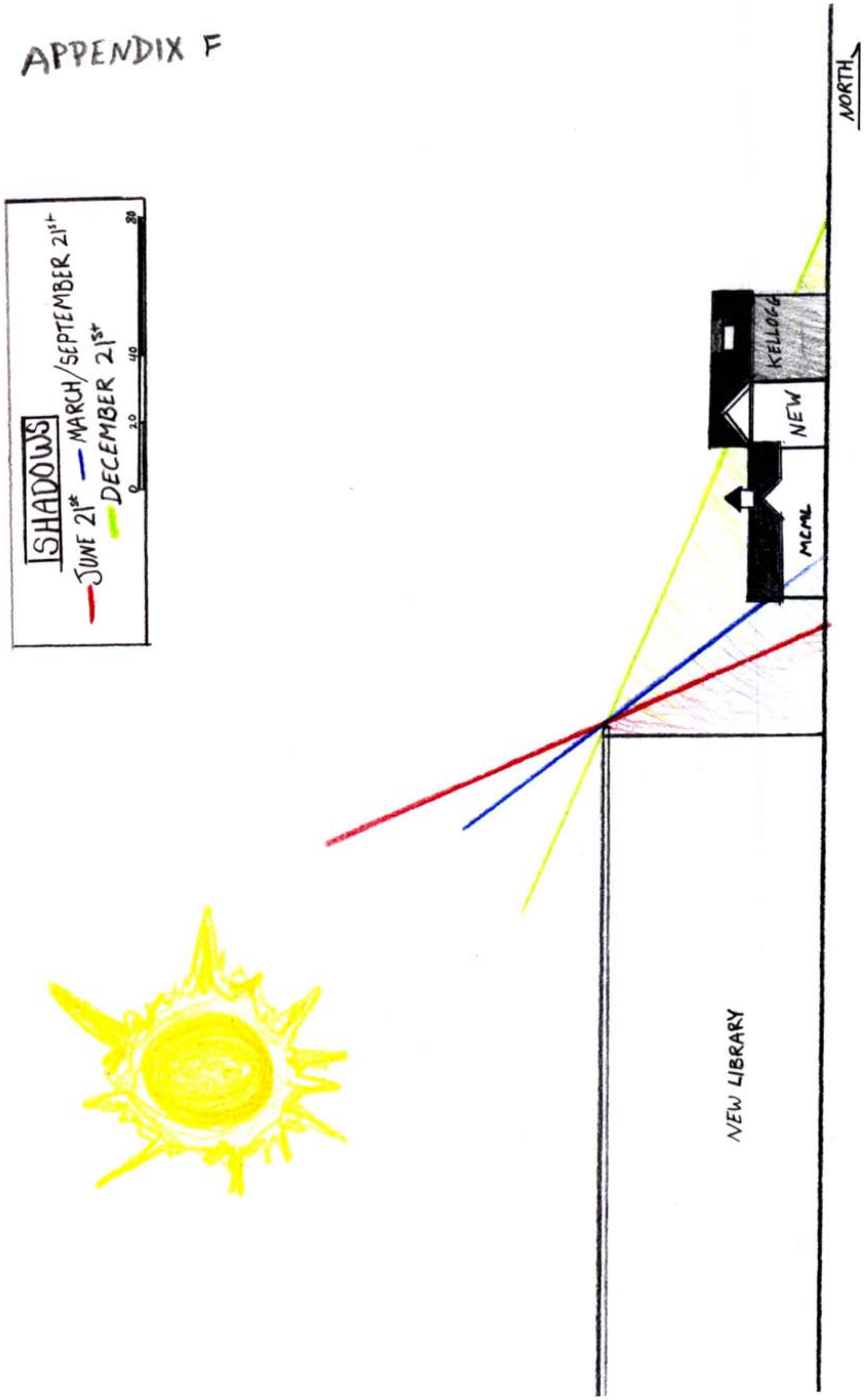
Appendix F-Sun Diagrams



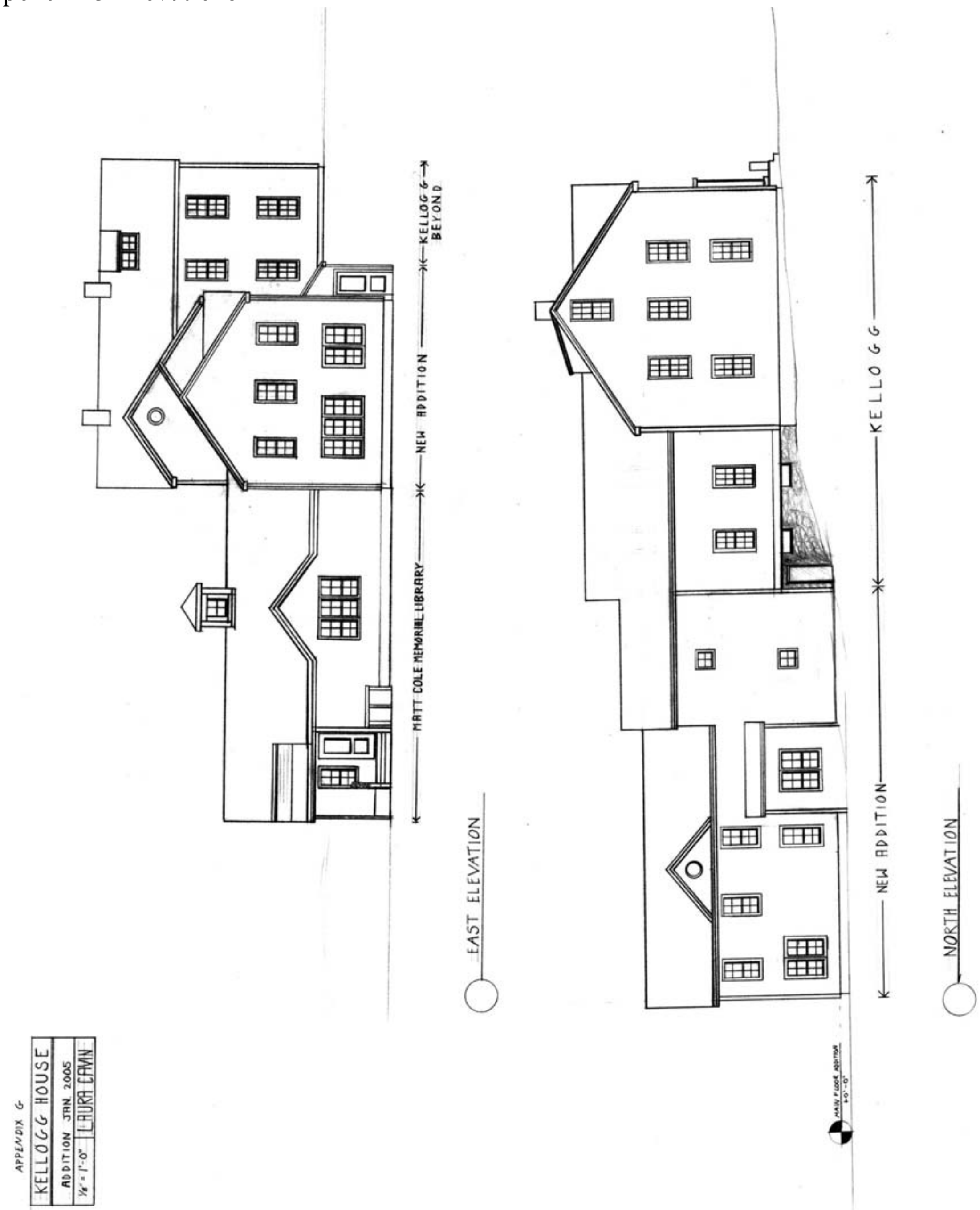
SHADOWS JUNE 21st
9am
12 noon
3pm
0
20
40
80
GOODRICH HOUSE
SEWALL HOUSE
KELLOGG
MCML
NEW LIBRARY
STETSON HALL

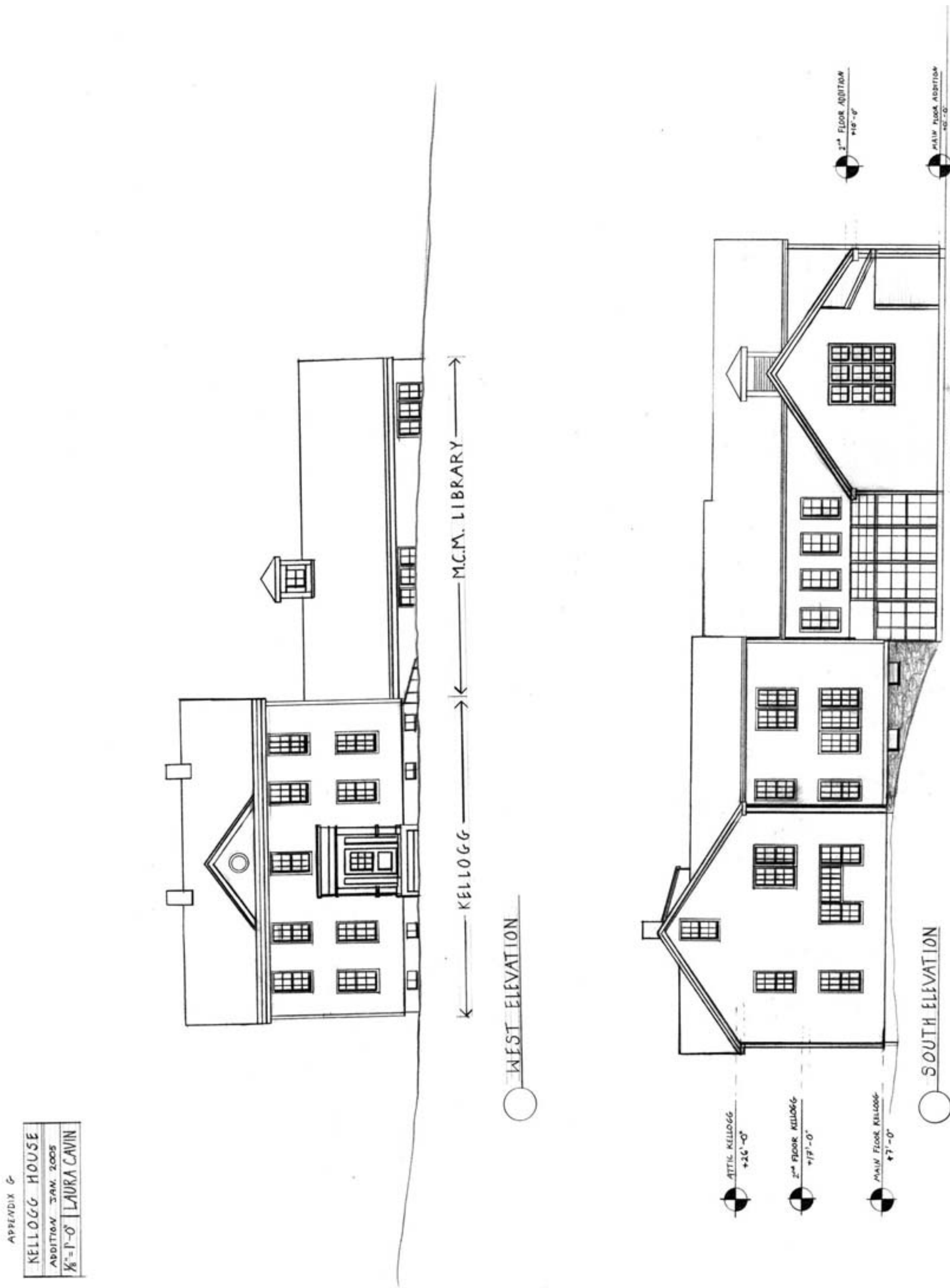

SHADOWS SEPTEMBER 21st
MARCH 21st
9am
12noon
3pm
0
20
40
80
GOODRICH HOUSE
SEWALL HOUSE
KELLOGG
MCML
NEW LIBRARY
STETSON HALL

APPENDIX F

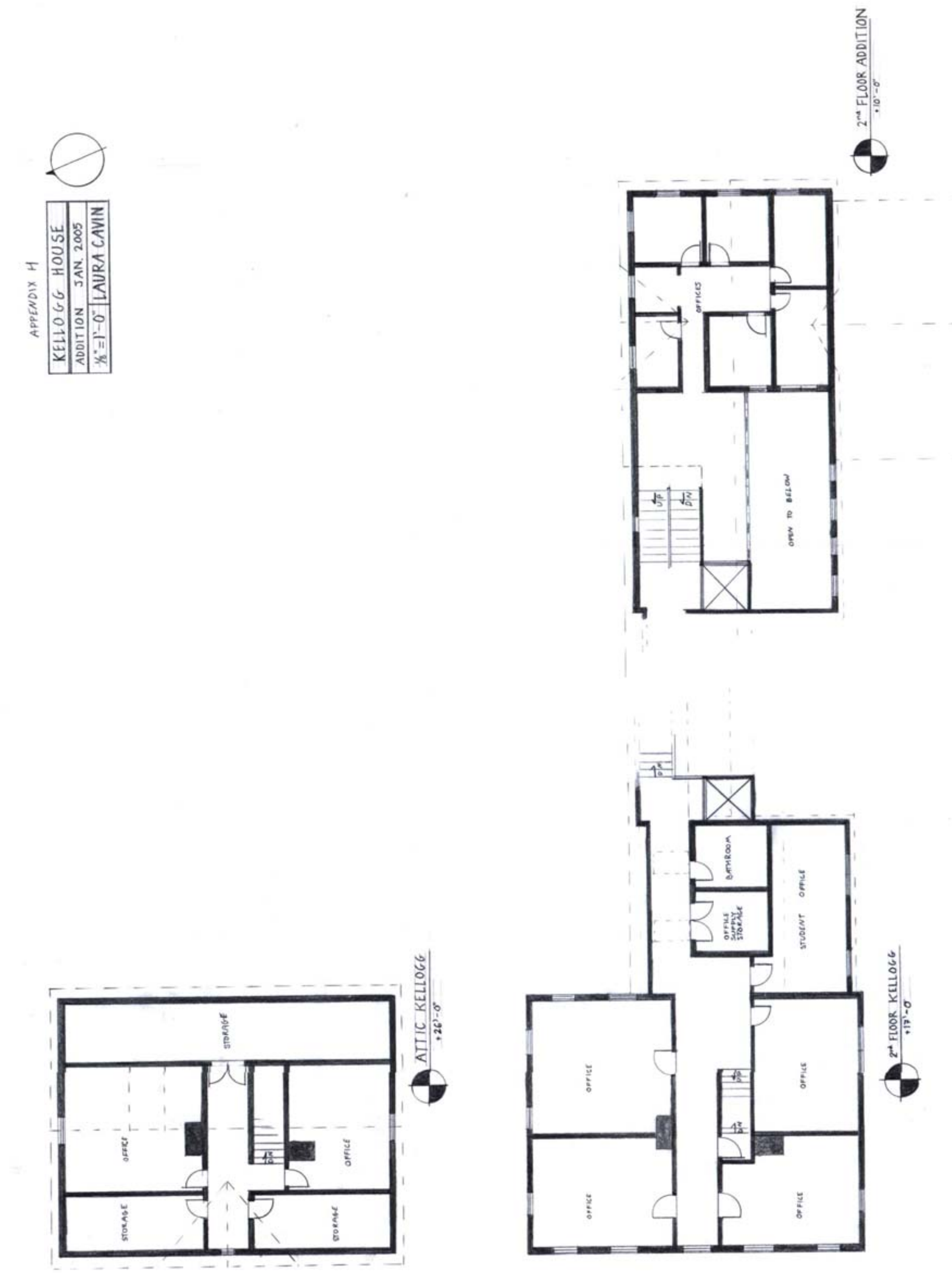

SHADOWS
JUNE 21st
MARCH/SEPTEMBER 21st
DECEMBER 21st
0
20
40
80
NEW LIBRARY
MCML
NEW
KELLOGG
NORTH

Appendix G-Elevations

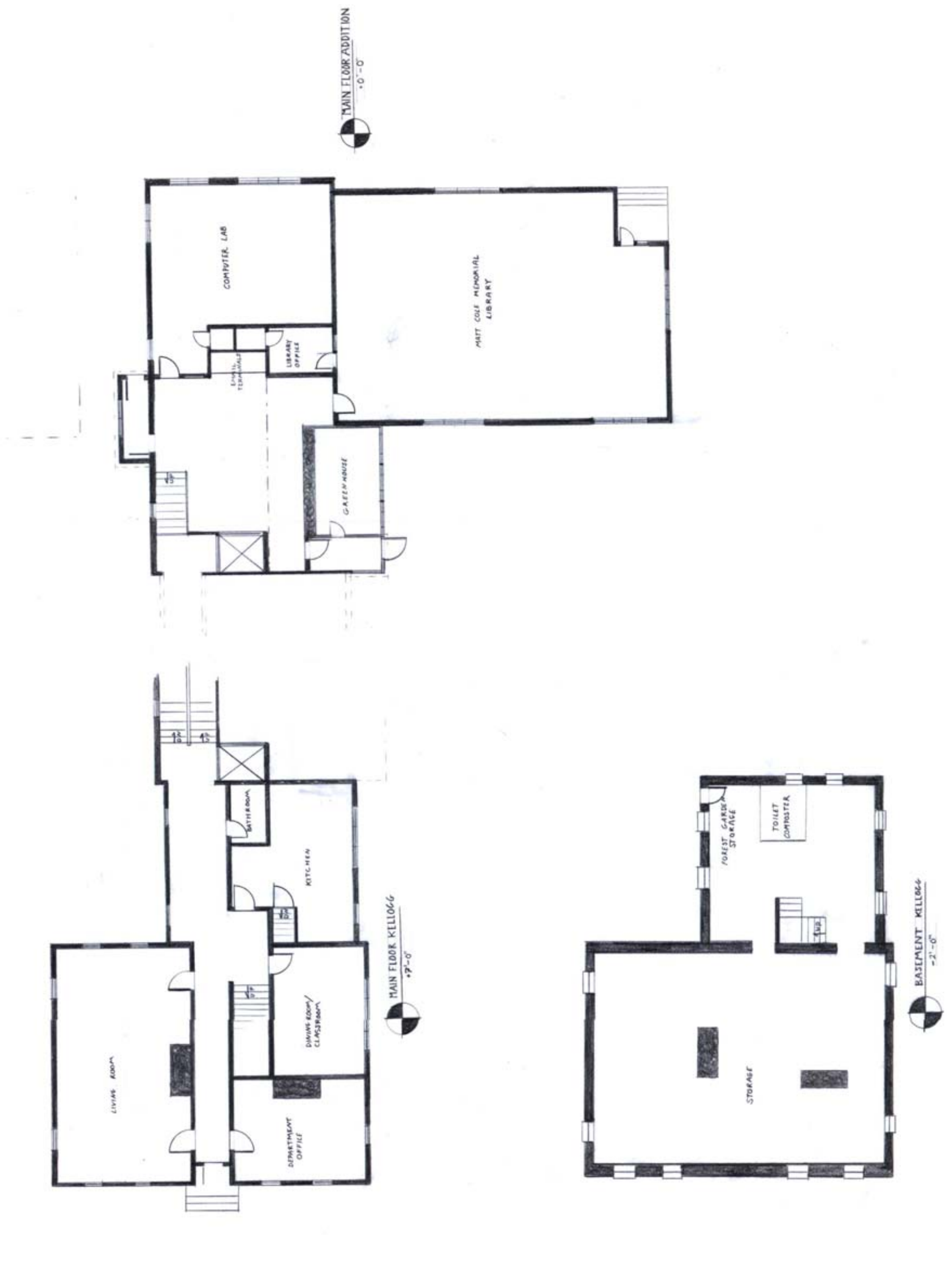



APPENDIX G
KELLOGG HOUSE
ADDITION JAN. 2005
LAURA CAVIN
WEST ELEVATION
KELLOGG
M.C.M. LIBRARY
SOUTH ELEVATION
KELLOGG
M.C.M. LIBRARY
NEW ADDITION BEYOND

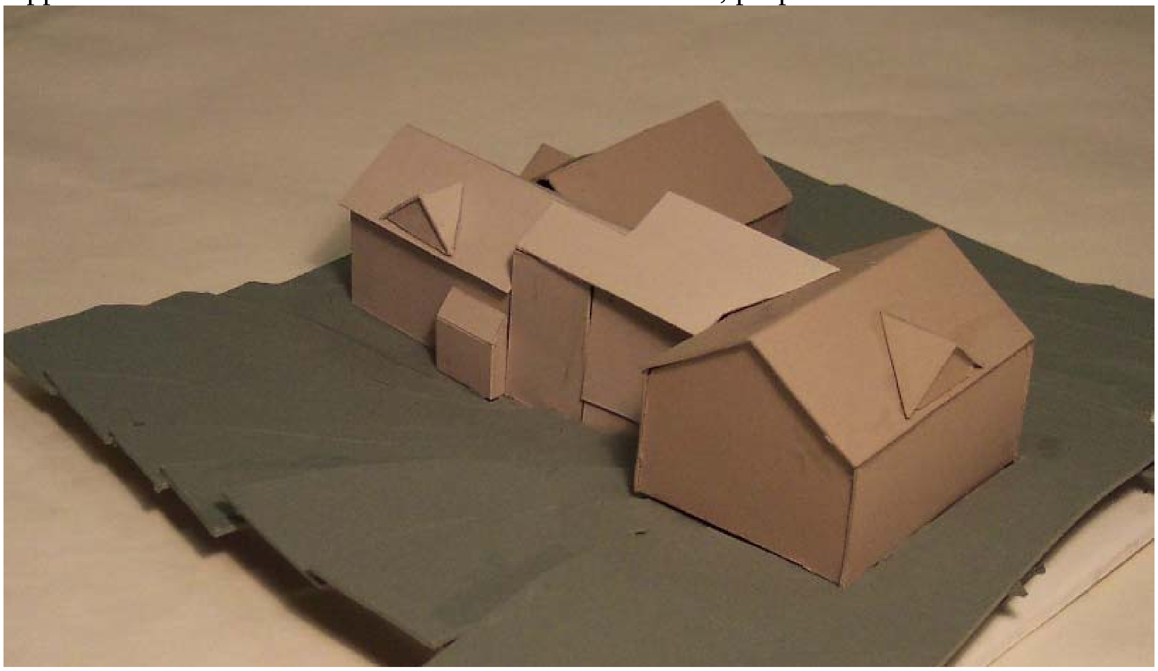
Appendix H-Floor Plans (attic and 2nd floor)



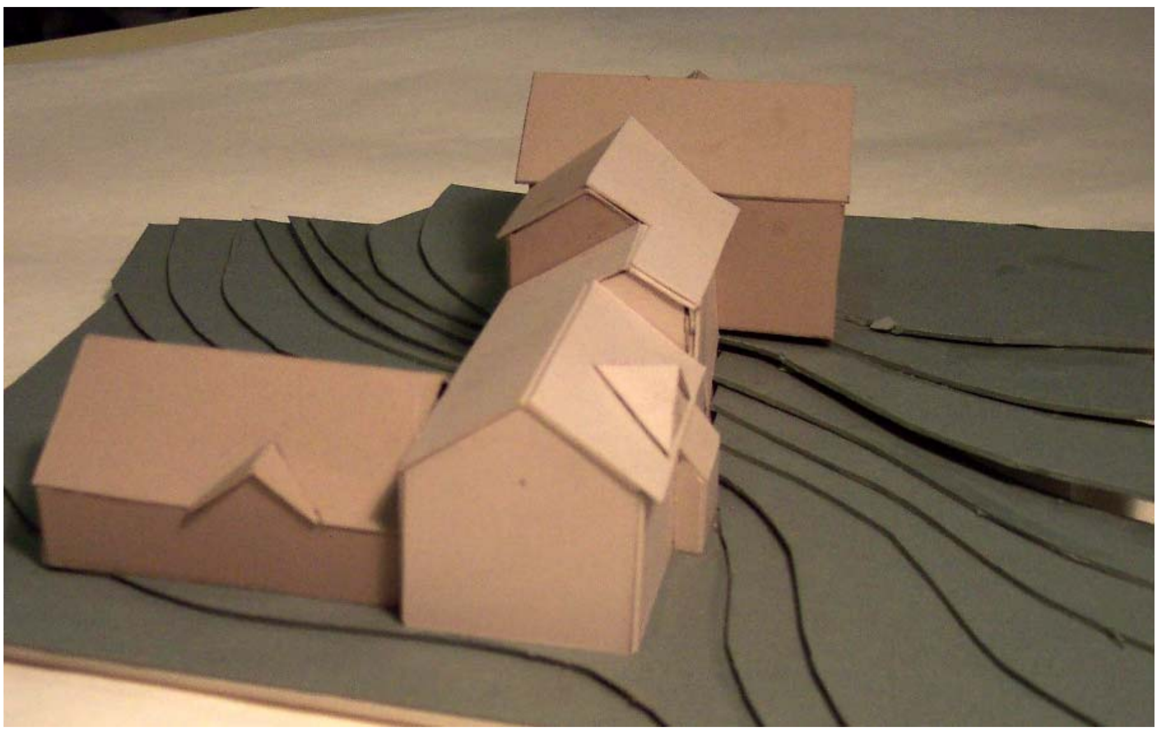
Appendix H- Floor Plans (1st floor and basement)



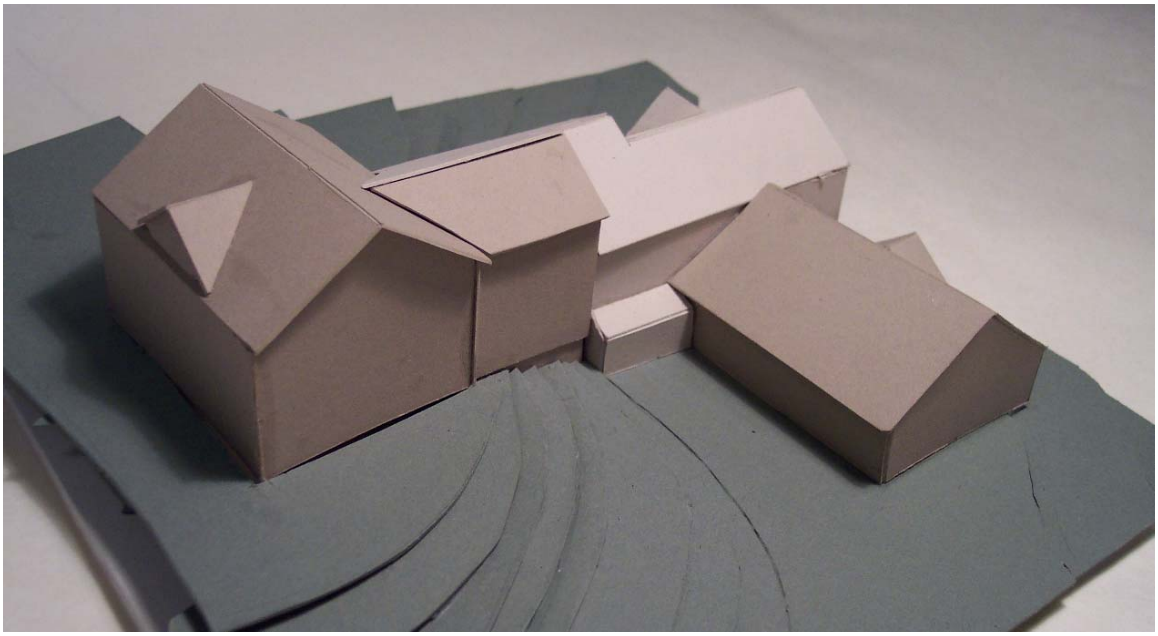
Appendix I- Pictures of Model –old in brown cardboard, proposed addition in white

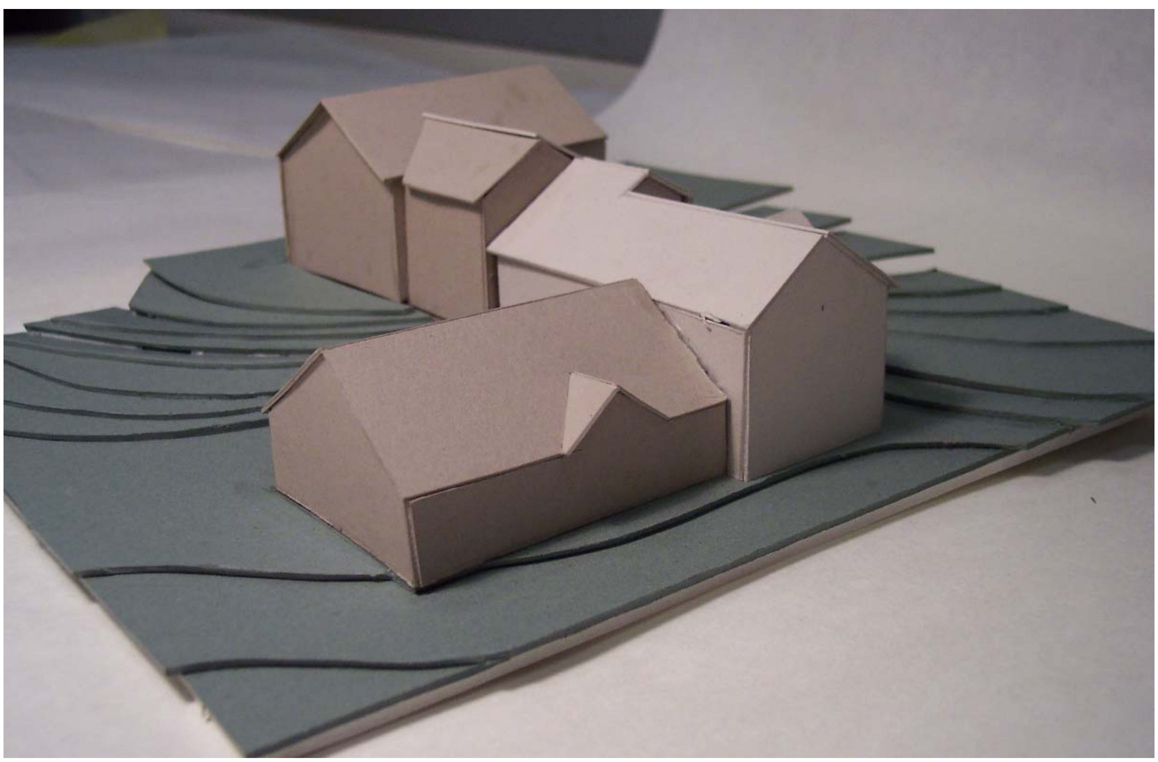


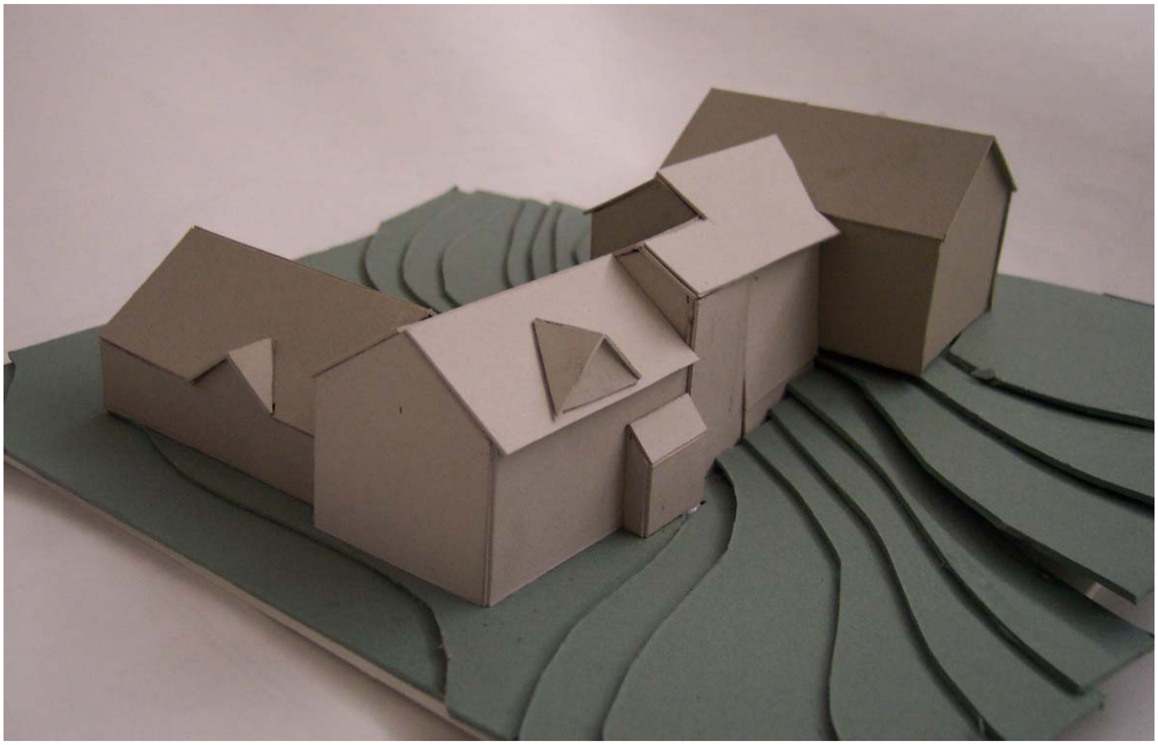
View from the Northwest



View from East


View from Southwest


View from southeast


View from Northeast

Appendix J

*****Student Survey of Kellogg House*****

I am doing a thesis pertaining to the relocation/renovation/redesign of Kellogg house in conjunction with the Center for Environmental Studies. I am looking at the history of the building/department, evaluating the current state of the program and building, and then developing possibilities for the future. But I need YOUR help. I would love to talk with anyone who interacts with Kellogg, and also those who don't. Please answer the following questions, some are intentionally vague to let you interpret and talk about what you want to. If you have any spare time, I'd be happy to set up a meeting and talk with you further.

Thanks, ~Laura Cavin phone #2615 05LPC@williams.edu SU 2670 Building #2___

1.Do you use Kellogg? Yes No (if no skip to # 5)

2.Why do you use CES/Kellogg? Circle all that apply

Library faculty offices study class hang out kitchen other______________

3.What brought you to Kellogg for the first time?

library faculty offices class meeting other________________

FEEL FREE TO WRITE MORE ON THE BACK**

4.How many hours a week do you spend in Kellogg? and doing what?

5.Do you feel comfortable in the building, why or why not?

6.Is Kellogg an inviting space? Physically and socially, Why or why not?

7.What do you LIKE about the spaces in Kellogg?

- living room:____
- library:____
- faculty offices:____
- GIS lab:____
- kitchen:____

-other________:____

8.What do you DISLIKE about the spaces in Kellogg?

- living room:____
- library:____
- faculty offices:____

-GIS lab:____

-kitchen:____

-other___________:____

9.What do you like about the location of Kellogg?

10.What do you dislike about the location?

11.If the Center for Environmental Studies were to move, where should it go on campus? Why?

12.What would you like to have in/near Kellogg that is not here currently?

13.Do you study in Kellogg? if yes, how much and where?

14.What would make you want to study in Kellogg more? Circle all that apply

carols more desks more lights noise reduction other____________________

THANK YOU!! This last section is for data collection purposes:

Are you an ENVI concentrator Y N How many ENVI classes have you taken:____________

If you want to set up a meeting please leave your email:____________

****Please deposit in the marked box in the hallway of Kellogg House****